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AUTHOR Caldwell, Edward C.
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ABSTRACT

The research reported here consists of three projects: Project I confirmed the hypothesis that as rules become more complex, direct rule learning becomes less efficient, compared to teaching by examples. Based on three experiments, Experiment 1 compared the inductive and deductive teaching of simple one-to-one correspondence rules; Experiment 2, the inductive and deductive teaching of rules that are more complex; and Experiment 3, rules that define the responses to some symbols in terms of symbol-pairs (e.g., the "o" in "hope" and "hops"). Project II consisted of a computer count of the frequency of vowel and/or consonant strings up to seven letters in length, using the corpus of words in "Computational Analysis of Present-Day American English." In essence, Project I was concerned with "how" to teach and Project II with "what" to teach. Based on the results of Project I lending support to the potential value of utilizing higher order units in teaching reading, Project III analyzed the existence of higher order units in the running text of two widely used reading series--the Ginn 360 series levels 3-4 and the Lippincott series levels Preprimer--3-2. (HS)

AN INVESTIGATION OF THE HIGHER ORDER GRAPHEME-PHONEME CORRESPONDENCES THAT OCCUR IN ENGLISH AND THE MEANS OF TEACHING THEM EFFICIENTLY.

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FINAL REPORT

Project No. 1-J-043

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Edward C. Caldwell
Assistant Professor, Educational Psychology
318 Miller Hall
College of Education
University of Washington
Seattle, Washington 98105

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Final Report

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Edward C. Caldwell
Assistant Professor, Educational Psychology
318 Miller Hall
College of Education
University of Washington*
Seattle, Washington 98105
with Dr. Percy D. Peckham and Mr. Don H. Nix
*address as of 8/1/72: Psychology Department
West Virginia University
Morgantown, West Virginia 26506

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ABSTRACT

Three projects in basic research in reading were conducted. Project I consisted of three experiments which investigated various training approaches to rule learning behavior using CAI terminals in a simulated reading task. Ss given practice on a rule performed better on transfer tasks of rule application than did example or example/rule combination groups when the rule was very simple, e.g. m says "mmm". When the rule was moderately complex (e.g. a rule paralleling the ci, ce rule in reading) there was no difference in the groups studied. When the rule was more complex, e.g. a rule closely paralleling the final e rule, the group taught the higher order units that were exact examples of the rule did better on transfer than all other groups, i.e. a rule group, and an example group given the higher order unit in larger clusters of symbols.

Project II utilized computer programs to analyze the most frequently occurring 18,000 words by outputting all bigrams, trigrams, tetragrams, pentagrams, hexagrams, and heptagrams, by gram, in an alphabetic list with all the words each gram appears in printed and lined up with that gram. The consistency in terms of pronunciation and location of the gram in the word of the most frequently occurring grams larger than bigrams was determined via frequency counts by human inspection.

Project III analyzed the first eight levels of reading text of the Ginn 360 and Lippincott reading series and produced output like that of the computer in Project II. Preliminary comparisons of grams in Project II and III were made.

PROBLEM AND OBJECTIVES

The significance of the skill of reading in our culture is obvious. Unfortunately, the best means of teaching that skill is mysterious. Gagne's (1965, 1970) application of Miller's (1966) concept of task analysis to the educational realm offers promising potential for student mastery - even of reading. By asking a simple basic question, "What would the individual have to know in order to be capable of doing this task when given only some instructions?" one is able to break down tasks into a hierarchy of learning structures which then can be taught to the "ready" student. "Readiness" here simply means the individual has mastered the subordinate elements in the learning structure essential for the task at hand.

By way of illustration, suppose the task to be mastered was "telling time to the nearest minute given a standard clock." Some of the subordinate skills that would aid in this task are "counting by ones up to 12," "counting by fives up to 55," "discriminating long (big) from short (little) hands on the clock," and others that may be essential. When these have been mastered, then by using appropriate instructions, a student should be able to be "taught" to "tell time." Much research (e.g., Caldwell and Hall, 1969, 1970; Gagne and Paradise, 1961; Hendrickson and Muehl, 1962; Jeffrey, 1958, 1966; and Jeffrey and Samuels, 1967) indicates that when tasks are more adequately analyzed humans, particularly young children, are able to perform at higher levels than much normative data would suggest.

Probably one of the most basic skills (tasks) for reading is learning to discriminate the letters of the alphabet. Previous research has demonstrated that when this task is analyzed appropriately, four and five year old Ss perform such discrimination very well (Caldwell and Hall, 1969, 1970). The present research is concerned with a more complex task, exploring the most efficient subordinate skills necessary for learning to decode graphemes, i.e., to make verbal responses to strings of graphic symbols. Since in the reading task the reader is expected to decode many words he has never encountered graphically before and even more words that he has encountered only a very few times, successful reading requires a high degree of generalization or rule using behavior. The crucial question, then, is "What subordinate skills are most efficient in training a reader to function as though he were using a very sophisticated set of grapheme-phoneme correspondence rules?" The obvious and perhaps naive answer is "Teach him the rules." This approach has traditionally been called the "phonics" approach. Chall (1967) refers to it as the "code" approach and after an extensive review of the pertinent literature concluded that the code emphasis approach is better than the meaning emphasis approach. The latter has often been referred to as the "whole word" approach.

In their concern for the code approach several investigators have reported or the consistencies, and lack thereof, between graphemes and phonemes in the English language, e.g., Burmeister, 1966; Clymer, 1963; Fry, 1964; Venezky, 1967, 1970; Venezky and Weir, 1966; Weir, 1964; Weir and Venezky, 1965.

Burmeister (1966) taught phonic and structural generalization to 8th and 9th graders utilizing either an inductive or a deductive approach. While there was no difference in reading improvement between these two approaches to rule learning, both groups taught the rules performed better than a control group given no training in rules.

In a carefully controlled laboratory study with college Ss, Bishop (1964) found that in a transfer situation letter training was far superior to whole word training. The letter training procedure was in effect the teaching of the rules - Letter x is pronounced y, where the xs were arabic letters and the ys their pronunciation. Thus considering Chall's review and the studies cited above, one is led to believe that rule learning is an efficient means of learning to decode.

There is, however, evidence that humans induce or discover rules that aid in decoding. (When we use the phrase "induce or discover rules," we mean that they function as if they knew the rule even if they cannot verbalize it.) Perhaps the Ss in Burmesiter's study improved because of the many examples they encountered rather than the direct study of the rules. Also, in the Bishop study cited above, many Ss in the whole word group performed very well on a transfer task because they had discovered the grapheme-phoneme correspondences. They concluded that, "even though a child is presented with 'whole words' and encouraged to associate printed words as a whole with the spoken word, he still begins to perceive some regularities of correspondence between printed and spoken terms and transfers these to the reading of unfamiliar terms." Gibson (1970) argues that young children not only search for regularities and structure but also that discovery of structure is reinforcing.

Further support for the notion that young Ss induce very complex rules comes from the studies of language development. The work of Berko (1958) demonstrated that children 4-7 years of age were very competent in using morphological rules concerned with inflections of verbs for past tense and of nouns for plurals, and possessives. Studies on syntactic development by Braine (1963) have further demonstrated the ability of children to induce complex rules. Similar results with adult Ss have been obtained by Foss (1968) and Palermo and Eberhart (1968).

Perhaps one of the reasons the debate over the phonic vs. whole word approach has been so heated is that both approaches do lead to an ability to function as though rules were being used. Thus it is possible that both the phonics approach and the whole word approach are correct and that reading may be taught and learned most efficiently by identifying those aspects of reading which are learned better by explicit learning of rules and those aspects which may be better learned by inducing the rule by exposure to many instances of its application. A strong possibility is that such an interaction between learning approach and difficulty of the rule to be used exists. Thus, the utilization of very simple rules in decoding may be most efficiently produced by fairly direct learning of the rule. Thus if a student is to learn that m says "mm" it may be best taught

as a rule rather than via a large number of words with m in them and no direct rule learning. However, as rules become more complex a point may be reached beyond which, for rapid decoding tasks, direct rule learning is not efficient. At this point, giving many examples of words or portions of words (higher order units) may result in better rule unilization than direct rule learning. Gibson argued that the appropriate units to teach in reading are neither single letters nor whole words but higher order units. Originally she argued that these were higher order pronounceable units (Gibson, Pick, Osser, and Hammond, 1962). More recently she has suggested that the key is not pronounceability but the rules of orthography. (Gibson, 1970).

PROCEDURE

The research consisted of three projects. Project I was composed of three experiments employing a simulated reading task designed to investigate the relationship between rule complexity, mode of presentation (deductive or inductive) and learning. Project II was designed to determine those units of learning (letter combinations) to which the results of Project I may be applied. This was done by counting the frequency of occurence of all letter combinations up to seven as they appear in the most frequently occuring words in written English. Project III was designed to determine the letter combinations that occur in two widely used reading series. In effect, it was the application of Project II procedures to two reading texts, utilizing a frequency count of the words in the texts as the input corpus.

In essence Project I was concerned with how to teach and Project II with what to teach. Project III was an attempt to determine to what degree the two reading series are representative of written English.

PROJECT I

Project I was designed and implemented in order to test the hypothesis stated above; i.e., as rules become more complex, direct rule learning becomes less efficient, compared to teaching by examples.

The research reported here confirms this hypothesis, based on three experiments using successively more complex rules in the learning task. Experiment 1 compares the inductive and deductive teaching of simple one-to-one correspondence rules, in which each symbol has one and only one response (eg., m says "mmm"). Experiment 2 compares inductive and deductive teaching of rules that are more complex. Contingency rules are used in which some symbols have different responses depending on the particular symbol that succeeds them (e.g., the "c" in "ace" versus the "c" in "cat"). Experiment 3 uses rules that define the responses to some symbols in terms of the following symbol-pair (eg., the "o" in "hope" and "hops"). Thus, Experiments 1, 2 and 3 use rules that increase in complexity. All of these rules are referred to as "automatic-responding" rules to stress their immediate, non-deliberative application.

The three experiments actually consisted of a computer program using 15 typewriter terminals for the student/computer interaction. The computer gave instructions to Ss and presented all stimuli and accepted and analyzed all responses, while also storing a complete record of Ss responses, response latencies, errors, partial errors, and total elapsed time. This use of the computer as E has several advantages such as eliminating experimenter bias, allowing all Ss to participate concurrently but independently, and accurately recording all data.

EXPERIMENT I

Materials. The learning materials were based on a six-symbol set of special characters which functioned as stimuli, each of which uniquely corresponded to a number from four to nine. Table I shows these one-to-one correspondences. Two sets of materials were constructed: one consisting of individual symbols ("letters"); one consisting of bigram and trigram combinations ("words").

TABLE I

Experiment 1 Rules

One-to-one Correspondences

Stimulus	Response
"	4
!	5
+	6
#	7
@	8
$	9

Subjects. The Ss consisted of 50 fifth and sixth grade students randomly assigned to five treatment groups, ten per group, five from each grade.

Procedure. The experiment consisted of three phases: (A) Introduction, (B) Practice, and (C) Testing.

(A) Introduction. Each S was told by a tape recording that this was a guessing game played with the computer and that they would receive a package of chewing gum when they finished. Then the computer began by asking the S's name, verifying that the S understood that it was a guessing game and explaining the experimental conventions and verifying that these were understood.

(B) Practice Phase. The five groups and their treatments were as follows:

(1) Rule-only Group (ROG). The ROG was trained on single symbols only, covering the six rules shown in Table 1.

(2) Rule-example Group (REG). The REG was treated the same as the ROG with the exception that after 8.5 minutes of practice the Ss were shown a set of five bigrams and trigrams with the corresponding numbers. Examples are ! + (56) and #+@ (768). Ss were neither requested nor allowed to respond during this 30 second study period.

(3) Example-only Group (EOG-5). This group was trained on the set of five bigrams and trigrams used in the REG study period.

(4) Example-only Group (EOG-10). This was the same as the EOG-5, except the training consisted of 10 bigrams and trigrams rather than 5.

(5) Example-rule Group (ERG). The ERG was treated the same as the EOG-5 with the exception that after 8.5 minutes of practice the Ss were shown the six symbols with their numbers and were neither requested nor allowed to respond during this 30 second study period.

Thus, the ROG saw no examples, or "words", during training and the EOG-5 and EOG-10 saw no individual symbols or "letters". The REG and ERG trained on letters and words, respectively, and then were shown, for 30 seconds, words and letters respectively.

The practice phase lasted nine minutes for each S. Each S was given the correct answer and the response latency in seconds, after having typed his answer. Ss were encouraged to type their answers immediately and to guess when they did not know the answer.

(C) Test Phase. All groups were given the same three following tests:

(1) Test on Rules. This test consisted of the six symbols. (Table 1)

(2) Text on Old Examples. This test consisted of the set of five bigrams and trigrams used in practice for the EOG-5, EOG-10, and ERG and the study period for the REG.

(3) Test on New Examples. This transfer-type test consisted of three bigrams and two trigrams never used in practice, conforming to the rules used in practice.

During testing Ss were informed of their response latency and whether their answer was correct, but were not given the correct answer. Appendix A shows a portion of the actual interaction of an S in the REG.

Results. The analysis of variance for a fixed effects randomized design model was used to determine initial significance. The Newman-Keuls pair-wise comparison test was used to make the 25 possible 2-mean comparisons for each test. The results of test scores are shown in Figure 1, Part a, ranked in descending order of mean number of correct answers. Significantly different comparisons are joined in brackets.

(a) Experiment 1

Test 1 (Letters)		Test 2 (Old Words)		Test 3 (New Words)	
ROG	4.5	ROG	1.7	ROG	3.1
REG	3.3	ERG	1.2	REG	1.3
ERG	2.7	REG	1.1	ERG	1.0
EOG-5	1.5	EOG-10	0.7	EOG-5	0.1
EOG-10	1.1	EOG-5	0.5	EOG-10	0.1
$F(4,45)=7.88$, $p<.05$		$F(4,45)=1.10$, $p>.05$		$F(4,45)=10.18$, $p<.01$	

(b) Experiment 2

Test 1 (Letters)		Test 2 (Old Words)		Test 3 (New Words)	
ROG	3.7	EOG	1.4	EOG	1.3
EOG	0.9	HOG	1.3	HOG	1.2
HOG	0.8	ROG	0.6	ROG	0.4
$F(2,27)=32.38$, $p<.01$		$F(2,27)=0.93$, $p>.05$		$F(2,27)=1.26$, $p>.05$	

(c) Experiment 3

Test 1 (Letters)		Test 2 (Old Words)		Test 3 (New Words)	
ROG	2.8	EOG	1.8	HOG	1.9
HOG	0.9	HOG	1.6	EOG	0.9
EOG	0.3	ROG	0.3	ROG	0.5
$F(2,27)=20.35$, $p<.01$		$F(2,27)=2.99$, $p>.05$		$F(2,27)=9.82$, $p<.01$	

FIGURE 1. Results of Experiments 1, 2, and 3 - Numerical Scales are Mean Number Correct, Brackets Join Groups that are Significantly Different.

In discussing the results, the language of the situation which the experiment was designed to simulate, that is, reading, will be used. The deductive training on rules is analogous to letter training, and the inductive training on examples is analogous to the whole-word approach. Thus Test 1 was a test on "letters" and Test 2 was on "words" previously seen in different amounts by all groups except ROG, and Test 3 was a test on new, never-before-seen "words."

On Test 1 the letter group (ROG) performed better than the other groups, with the exception of the other letter-oriented group (REG). This may be interpreted to mean that given a fixed amount of time and the goal of teaching letters, the best way is to present these letters in isolation rather than in words. This test was basically a retention test for the ROG and the REG and an induction test for the other three groups.

Test 2 shows no significant differences between any of the groups. This may be interpreted to mean that, again given a fixed amount of time, with the goal of teaching a fixed set of words, then it makes no difference whether letter-training or word-training is used. Teaching the letters without using any words, or teaching words without giving any letters in isolation, (by either teaching only the words to be tested or a superset of those words), or using some combination of these approaches, has the same result. This test was a retention test for the EOG-5, EOG-10 and the ERG. It was a transfer-type test for the ROG and to a lesser extent the REG.

Test 3 is a transfer test for all groups. The words in this test had not been used anywhere in practice. The results show that the ROG, trained only on letters, was better equipped to recognize new words than each of the other groups. None of the other groups was significantly different from each other. This indicates that an S had more success learning the letters directly and then applying them on his own, without even having seen words before, than by inducing or generalizing from one set of words to another set using the same rules or than by replacing some letter practice with studying examples.

Further results. One problem that had been expected was that Ss would not respond quickly enough, especially when they did not feel they knew the answer. The computer program encouraged guessing, as has been described, but it was unable to actually force the S on to the next item, due to limitations of the typewriter terminal that was used. This meant that the computer would have to rely on its encouragements-to-guess in order to keep up the pace, and also to keep the pace approximately the same for all Ss. According to the data, this was accomplished. For example, there were no significant differences between any of the five groups, in terms of the elapsed time for the three tests. Also, the EOG-5 and EOG-10 should have received approximately the same number of items during practice and this was the case. There were no significant differences between these two groups. Finally, there were no significant differences between any groups in terms of average response latency on Tests 2 and 3 although the ROG did respond, on the average, more rapidly on Test 1 than the REG.

Another result of interest concerns the difference between the number of items received in practice by the ROG and the REG. This difference is significant at the .01 level and presumably is the result of the difference in practice time, with the ROG getting about 30 seconds more practice on rules (letters). Since the ROG performed better on all tests, and significantly so on Test 3, this may indicate further that actual practice on the rules is more useful than time spent on examples.

Finally, it is interesting that the EOG trained on five words (EOG-5) and the one trained on 10 words (EOG-10) did not perform significantly differently on any of the tests. That is, limiting the "vocabulary" while keeping the same number of different letters did not make rule-learning, or word-learning, or transfer-type learning, any easier.

Discussion. In general, the results of Experiment 1 indicate that teaching rules deductively, as in letter training, is the more effective technique, assuming the goal of the teaching is to teach an S to recognize new words, or is to teach the rules, or letters, themselves. However, it was hypothesized that these results are partially contingent on the fact that the rules used are very simple one-to-one correspondence rules. It was thus hypothesized that more complex rules may more efficiently be learned through repeated examples rather than through an explicit statement. Experiments 2 and 3 show this.

EXPERIMENT 2

Materials. A five-symbol subset of Experiment 1's special characters was used. Four symbols had one-to-one numeric correspondences, while the fifth symbol (the +) had two numeric correspondences, depending on whether it was followed by the # or the !. Table 2 shows these rules. For example, the rule that the + in @+# or @+! is 3 (@+# is 837, @+! is 835), but is six if not followed by # or ! is analogous to the "c" rule in which "c" is pronounced "sss" if followed by "e" or "i" but "kkk" if followed by anything else.

TABLE 2

Experiment 2 Rules

One-to-one Correspondences

Stimulus	Response
"	4
!	5
#	7
@	8

Contingency Correspondences

Stimulus	Response	Condition
+	3	if followed by # or !
+	6	if not followed by # or !

Subjects. The Ss consisted of 30 fifth and sixth grade students randomly assigned to three treatment groups, 10 per group, five from each grade. No Ss had participated in Experiment 1.

Procedure. Experiment 2 consisted of four phases: (1) Introduction, (2) One-to-one Practice, (3) Contingency Practice and (4) Testing.

(A) Introduction. See Experiment 1.

(B) One-to-one Practice. All three groups received five minutes of "letter training" on the four one-to-one rules in the style of Experiment 1. These rules were considered as prerequisite to learning the contingency rule and Experiment 1 indicated letter training is the best way to teach them. Ss were encouraged to guess and answer immediately.

(C) Contingency Practice. The three groups and their treatments were as follows:

(1) Rule-only group (ROG). The ROG was trained on the contingency rule directly, using fill-in-the-blank questions such as "when + has # after it, then + is _____", with the correct answer being 7. No example "words" were seen. (See Table 2 for the rule).

(2) Example-only group (EOG). The EOG was trained on "words" that were based on the contingency rule, without seeing the rule in isolation. For example, the word @+# has the answer 837, whereas#+" is 764, according to the one-to-one rules and the contingency rule in Table 2. Five different words were used.

(3) Higher-order-unit-group (HOG). The HOG was trained on bigrams that defined the contingency rule. For example, the bigram +# is 37 whereas +! is 35 and +@ is 68. Ss in this group never saw the individual rule statement (as did the ROG) and did not see the rule bigrams embedded in longer strings (as did the EOG). The higher-order units were treated as units rather than composites. Five different bigrams were used.

This practice phase lasted 10 minutes for each group. Ss were encouraged to guess and answer immediately. Ss were given the correct answers if they made an error and "Right" if they made the correct response. Also, their response latency was always given to them.

(D) Test Phase. All three groups were given the three following tests.

(1) Test on rules. This test was the same as the contingency practice phase for the ROG. Neither the EOG nor the HOG had seen the rules in isolation.

(2) Test on old examples. This test covered the trigram words used in the EOG contingency practice phase. Neither the ROG nor the HOG had seen words. Thus, the ROG would have to have learned that @+# is 837 from having been trained that @ is 8, # is 7 and when + is followed by #, then + is 3. The HOG have learned that @+# is 837 from learning that @ is 8 and that +# is 37. Five different words were used.

(3) Test on new examples. This test used trigram words that had not been seen before by the EOG. Thus, the EOG would have to know that !+# is 537 from having been trained on words like @+# (837) and having been trained as in the one-to-one practice phase. For the ROG and HOG, this test would be no different than Test 2. Five different words were used.

During testing Ss were informed of their response latency and whether their answer was correct, but were not given the correct answer.

Results. Newman-Keuls was again used on test means. The results are shown in Figure 1, Part b.

Figure 1 shows that the only significant differences between groups were on Test 1. The ROG scored significantly higher ($p < .01$) than each of the other two groups. The EOG and HOG did not differ from each other ($p > .05$).

It was verified (as in Experiment 1) that Ss responded uniformly rapidly from group to group by comparing the number of responses tagged as too slow in practice. Also, the elapsed time for Tests 1, 2 and 3 were used.

Discussion. If the goal is teaching Ss to recognize words never seen before, then according to Experiment 2 it makes no difference whether Ss are taught deductively (as in the ROG) or inductively (as in the EOG and HOG). The ROG clearly knew the rules better than the other two groups (Test 1) but did not do any better or worse than the other two groups as far as recognizing words (Tests 2, 3).

Experiment 1, on the contrary, showed that the ROG did perform better on recognizing new words. The difference between the two experiments is mainly in the complexity of the rules being learned. The trend, then, is for rule-learning to be better on simple rules, but not for more complex rules (Experiment 2). Experiment 3 supports and extends these results.

EXPERIMENT 3

Materials. The same five symbols used in Experiment 2 were used in Experiment 3 but with some different meanings. Three symbols had one-to-one numeric correspondences while two symbols (the + and #) had two different numeric correspondences, depending on whether or not they were followed by the symbol-pair @!. Table 3 shows these rules. For example, the rule that the + in +@! is 6 (+@! is 685), but is 3 in +@" (+@" is 384), is analogous to the final "e" rule in which "o" is pronounced differently in "hope" than in "hops".

TABLE 3

Experiment 3 Rules

One-to-one Correspondences

Stimulus	Response
"	4
!	5
@	8

Contingency Correspondences

Stimulus	Response	Condition
+	6	if followed by @!
+	3	if not followed by @!
#	7	if followed by @!
#	2	if not followed by @!

Subjects. The Ss consisted of 30 fifth and sixth grade students randomly assigned to three treatment groups, 10 per group, five from each grade. No Ss had participated in Experiment 1 or 2.

Procedure. Experiment 3 consisted of four phases: (A) Introduction, (B) One-to-one Practice, (C) Contingency Practice and (D) Testing.

(A) Introduction. See Experiment 1.

(B) One-to-one Practice. All three groups received four minutes training on the three one-to-one rules as was done in Experiment 2.

(C) Contingency Practice. The three groups and their treatments were the same as in Experiment 2 except the rules were more complex.

(1) Rule-only Group (ROG). These Ss were trained on the contingency rules (see Table 1) using fill-in-the-blank statements such as "When the + has @! after it, then + is _____". No words were seen.

(2) Example-only Group (EOG). These Ss were trained on words as in Experiment 2, using five different words.

(3) Higher-order-unit Group (HOG). These Ss were trained on trigrams defining the contingency rules.

This practice phase lasted 12 minutes for each S, and Ss were encouraged to guess and answer immediately. Feedback to Ss was the same as on Experiments 1 and 2.

(D) Test Phase. This phase consisted of the same three tests used in Experiments 1 and 2 except that Experiment 3's rules were used.

Results. Newman-Keuls was again used on test mean scores. The results are shown in Figure 1, part c. For Test 1 (test on rules in isolation) the ROG scored significantly higher than both the EOG and HOG ($p<.01$). There were no differences on Test 2 ($p>.05$) which consisted of words used during the EOG training. On Test 3 the HOG performed best ($p<.01$) being better than both the EOG and the REG. Finally, the total time taken to complete the experiment did not differ between groups.

Discussion. Test 3, in all three experiments, is the only test of recognizing new words. (Test 2 always consists of new words for the ROG and HOG, but not for the others, whereas Test 1 contains no words). Therefore, this test is the focus for the hypothesis being tested.

In Experiment 3, the HOG performed best on this test. This means that given a rule that defines a symbol in terms of the two following symbols, it is better to teach the rule by giving examples of it in higher-order units. Teaching the rule explicitly is not efficient, even though the rule is actually learned (Test 1). This can be stated in terms of an actual example to which Experiment 3 is analogous.

An S would learn how to pronounce the "o" in words like "hope", versus words like "hops", by being given examples like "ope" and "ops". This would be more efficient than by teaching the S to correctly verbalize the rule that underlies this pronunciation. It would also be more efficient than by teaching whole-word examples.

Thus, Experiment 3 extends the trend begun in Experiments 1 and 2. Rule learning becomes less effective compared to higher-order unit learning, as the rule becomes more complex. Figure 1, Parts a, b and c show this trend.

PROJECT II

As indicated earlier, much work has been done relative to discovering the consistencies in the English language, i.e., grapheme-phoneme correspondences. Venezky and Weir (1966), using the computer as a research tool, have undoubtedly done the most complete analysis. However, their work was limited to an analysis of vowel strings or consonant strings. They did not look at vowel and consonant combinations. Consequently, the rules they are able to generate do not readily lend themselves to the study of higher order units of reading such as Gibson et. al. (1962) and Gibson (1970) have argued are the appropriate units to teach in reading.

The second aspect of the present research was an extension of Venezky and Weir's research. A computer program was written that counted the frequency of vowel and/or consonant strings up to seven letters in length. The corpus of words analyzed was taken from Computational Analysis of Present-Day American English (Kucera and Francis, 1967). All of those words that appeared three or more times in their corpuses of 1,014,232 words were examined in the present analysis with the following exception: numerical input, names of people, and hyphenated words. Approximately 18,000 words were included in this corpus.

Samples of the output from the program are illustrated in Tables 4, 5, and 6. Table 4 shows a page from the alphabetic listing of the trigrams with the words beneath it in which that trigram appears. The number to the right of the row of asterisks indicates the number of words in which the trigram appears. (ium appears in 24 words while iuo and iur occur in only one word each. i.e. they are unique). The number to the left of each work indicates the frequency of that word in the corpus of the 1,014,232 words analyzed by Kucera and Francis (1967). Thus, the word medium appears approximately 45 times per million in running text.

Table 5 shows a page from the alphabetic listing of the tetragrams without the words they appear in. The number to the right represents the number of words in which that tetragram appears. Table 6 shows the first page from the rank order listing of the tetragrams. The combination tion appears in 821 of the approximately 18,000 words examined; less appeared in 67 different words.

The tables show only samples of the output. The complete output consists of 528 bigrams, 4395 trigrams, 14,868 tetragrams, 23,350 pentagrams, 24,542 hexagrams and 20,987 heptagrams, i.e. slightly more than three and one half feet of bound output. The output is stored on two magnetic tape reels.

TABLE 4
A Sample Page of Trigrams and
the Words in Which They Appear.*

```
                    IUM
                45-MEDIUM
               25-STADIUM
                16-OPIUM
                15-HELIUM
             14-AUDITORIUM
           13-EQUILIBRIUM
               12-PREMIUM
                12-SODIUM
               11-CALCIUM
              9-SYMPOSIUM
              6-GERMANIUM
                6-URANIUM
              5-POTASSIUM
               4-CHROMIUM
                4-GALLIUM
            4-MILLENNIUM
               3-DELIRIUM
               3-PSYLLIUM
                  3-MEDIUMISTIC
                  22-TRIUMPH
                   5-TRIUMPHANT
                   8-TRIUMPHANTLY
                   3-TRIUMPHS
                  4-MEDIUMS
**************************************   24

                    IUC
             5-HARMONIUCS
**************************************    1

                    IUR
                 5-DIURNAL
**************************************    1

                    IUS
               23-GENIUS
                9-RADIUS
         4-GASTROCNEMIUS
**************************************    3

                    IVA
                   4-SALIVA
              11-CONCEIVABLE
              10-CONCEIVABLY
                   3-VIVACIOUS
                  12-PRIVACY
                32-SURVIVAL
               27-FESTIVAL
                23-ARRIVAL
                  12-RIVAL
                9-CARNIVAL
                 6-REVIVAL
              3-ADJECTIVAL
                 5-AMBIVALENCE
                  -EQUIVALENCE
                46-EQUIVALENT
                 6-AMBIVALENT
                 8-EQUIVALENTS
                   3-RIVALRIES
                   6-RIVALRY
                 5-REVIVALS
                 3-ARRIVALS
                3-FESTIVALS
                   6-CIVAN
```

*See text for further explanation.

TABLE 5
A Sample Page of Alphabetic Listing of Tetragrams*

LIFF	-	2
LIFI	-	9
LIFO	-	2
LIFT	-	4
LIFY	-	2
LIGA	-	5
LIGE	-	7
LIGH	-	33
LIGI	-	10
LIGN	-	3
LIGR	-	2
LIHO	-	2
LIKE	-	17
LIKI	-	1
LILA	-	2
LILL	-	1
LILT	-	1
LIMA	-	4
LIMB	-	5
LIME	-	5
LIMI	-	13
LIMM	-	1
LIMO	-	1
LIMP	-	4
LIN≠	-	1
LINA	-	2
LINC	-	1
LIND	-	8
LINE	-	43
LING	-	145
LINI	-	6
LINK	-	3
LINO	-	1
LINQ	-	6
LINT	-	4
LION	-	13
LIOU	-	1
LIPP	-	9
LIPS	-	5
LIPT	-	1
LIQU	-	5
LIRI	-	1
LISB	-	1
LISH	-	29
LISI	-	1
LISK	-	1
LISM	-	19
LISS	-	2
LIST	-	44
LITA	-	12
LITE	-	15
LITH	-	2
LITI	-	28
LITT	-	7
LITU	-	1
LITY	-	73
LITZ	-	2
LIUM	-	3
LIVA	-	1
LIVE	-	15
LIVI	-	1
LIVR	-	1
LIZA	-	18
LIZE	-	38
LIZI	-	6
LIZZ	-	1

*See text for explanation
**≠ is an appostrophe

TABLE 6
A Sample of Rank Order Listing of Tetragrams

TION	-	821
ATIO	-	478
TING	-	299
MENT	-	251
IONS	-	247
ATED	-	163
RING	-	160
ABLE	-	147
LING	-	145
SION	-	145
DING	-	141
ICAL	-	140
RATI	-	134
COMP	-	133
INTE	-	132
ALLY	-	130
NING	-	129
CTIO	-	128
TIVE	-	127
NTER	-	123
ANCE	-	117
IGHT	-	112
ENCE	-	110
ENTS	-	107
CONS	-	102
NESS	-	102
OVER	-	98
ERED	-	97
ENTI	-	96
ECTI	-	95
SING	-	92
STER	-	92
CONT	-	91
IONA	-	91
RATE	-	91
NDER	-	89
TURE	-	89
STRA	-	86
THER	-	86
EMEN	-	83
ITIO	-	83
ONAL	-	83
TATI	-	82
COMM	-	81
RESS	-	81
ATIN	-	79
ERAT	-	79
HING	-	78
PRES	-	78
TIES	-	75
KING	-	74
PORT	-	74
TERS	-	74
LITY	-	73
ESSI	-	72
LATI	-	72
INGS	-	71
SPEC	-	69
ICAT	-	68
CATI	-	67
ERIN	-	67
LESS	-	67

The most frequently occuring letter combinations larger than bigrams that also were pronounceable to the examiners were examined to determine the number of different pronunciation mappings, the number of words in which each mapping appears and the location of the letter combination in the word (initial, medial, or final). Those that mapped to more than six pronunications were generally omitted. The results of this examination are presented in Table 7. Thus the trigram ing has three different mappings: one as in impinge (0 in initial position and 2 in medial and 12 in final position); the second as in sing (none in initial position are pronounced as in sing, 73 in medial position and 1,464 in final position are pronounced as in sing); and the third as in ingredient (all three in initial position).

It is hypothesized that many of the combinations in Table 7 are used by good readers and that most of those not included are not attended to by good readers. This obviously is an empirical question which needs to be tested. It must be stressed that the information in Table 7 is the result of preliminary examination only. No reliability check on examiners was made. Also it is not to be inferred that the different mappings indicated are accurate for dialects different from the examiners. Table 7 shows that in general the longer the gram, the fewer the different mappings, i.e., the higher the consistency.

TABLE 7
(pages 21-163)

Alphabetic and Rank Order Listings
of Trigram through Heptagram Analysis
of Computer Output listing the gram,
the number of words in which it appears,
an example of its pronunciation mappings
and its location in the word.

The report of Project III
begins on page 164

Trigrams - Alphabet List

	Initial	Medial	Final
abl-186			
capable	2	163	0
enabled	0	12	0
established	0	7	0
acc-71			
accacia	67	3	0
staccato	0	1	0
ace-85			
place	2	22	32
surface	0	2	14
peace	0	3	1
academically	0	9	0
ack-89			
back	0	50	39
act-147			
factors	20	102	25
age-156			
stage	7	11	15
average	1	26	83
garage	0	0	7
eager	3	1	0
copenhagen	0	1	0
Almagest	0	1	0
ail-79			
prevail	2	42	33
thailand	0	1	0
superficially	0	1	0
ain-168			
certain	0	5	22
maintain	1	92	48
ake-79			
mistake	0	26	33
chesapeake	0	14	1
naked	0	2	0
soaked	0	2	0
nutcracker	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
ale-71			
scale	1	23	24
morale	0	10	5
ambivalent	3	4	0
totaled	0	1	0
all-275			
balled	19	167	0
all(l)	0	28	36
ballistic	12	10	0
shall	0	0	2
als-74			
scandals	0	0	70
false	1	3	0
ame-79			
same	0	11	22
madame	0	0	1
dreamed	0	6	0
foamed	0	1	0
amended	12	26	0
anc-156			
chance	4	52	0
distance	0	90	0
anchor	2	7	0
ancient	1	0	0
and-186			
brand	1	124	29
island	0	9	18
wander	0	5	0
ang-84			
sang	8	20	9
change	1	46	0
ani-99			
pennsylvania	0	2	3
organic	0	88	0
meaning	0	6	0

Trigrams - Alphabet List

	Initial	Medial	Final
ans-120			
plans	4	70	38
cleansing	0	1	0
beans	0	0	6
loans	0	0	1
ant-242			
ant(1)	31	56	14
meant	11	3	110
want	0	10	4
substantial	0	2	0
meantime	0	1	0
app-127			
appalling	72	55	0
ard-136			
toward	4	48	84
are-104			
are	3	5	0
care	45	2	35
cleared	0	12	0
soared	0	2	0
ari-141			
variable (wearing)	3	97	0
marina	0	36	0
arise	3	0	0
soaring	0	2	0
art-138			
part	28	76	16
quart	0	10	1
dearth	2	3	2
ary-77			
rotary	0	0	12
wary	1	2	62
ass-133			
class	64	24	37
compass	0	4	4

Trigrams - Alphabet List

	Initial	Medial	Final
ast-148			
last	10	73	24
least	0	5	7
coast	0	5	5
waste	0	19	0
ate-467			
ate(1)	0	175	159
immediate	0	25	47
threaten	0	6	0
repeated	0	11	0
floated	0	3	0
strategic	0	3	0
strategy	0	12	0
guatemale	0	1	0
water	0	1	0
material	0	15	0
maternal	0	5	0
whatever	0	4	0
extraterestial	0	1	8
att-99			
attach	53	46	0
ave-73			
gave	0	15	18
have	8	18	1
weave	0	9	3
loaves	0	0	1
ber-79			
number	7	37	32
siberia	1	2	0
ble-256			
possible	0	21	213
bleached	5	0	0
problem	9	7	0
blew	1	0	0
cal-193			
musical	0	53	96
calamity	1	0	0
calcium	23	8	0
call	6	2	0
scalp	2	2	0

Trigrams - Alphabet List

	Initial	Medial	Final
can-67			
American	32	23	12
car-83			
car (car, cars)	34	7	5
oscar	2	0	2
caravan	26	7	0
cat-135			
cat	30	2	2
indicate	3	90	0
delicate	0	7	0
staccato	0	0	0
cen-86			
innocence	21	61	0
scene	0	4	0
ces-132			
chance	0	49	80
indices	0	1	2
chi-101			
hibachi	0	1	1
bronchia	4	9	0
psychiatrist	0	4	0
chick	10	1	0
chicago	2	4	0
chief	17	4	0
china	5	0	0
children	10	29	0
com-262			
come	147	39	0
combat	61	13	0
comb	2	0	0
con-430			
bacon	253	40	4
con(1)	113	16	0
cone	3	0	0
cor-90			
decor	53	35	2

Trigrams - Alphabet List

	Initial	Medial	Final
cre-84			
acre	0	0	3
acreage	31	50	0
cur-72			
occur	27	17	5
secure	7	16	0
ded-126			
needed	2	1	115
deduce	8	0	0
den-131			
garden	25	85	20
pasadena	0	1	0
der-208			
slender	1	66	134
derision	5	0	0
derivation	2	0	0
des-110			
insides	59	17	34
dic-75			
periodic	9	32	5
handicap	0	20	0
dice	1	2	0
prejudice	0	6	0
din-168			
cardinal	3	21	0
dind	2	0	0
readiness	0	1	0
deciding	1	140	0
duc-64			
educate	7	0	0
produce	0	25	0
ducked	5	27	0
ead-73			
head	0	30	24
plead	0	14	4
breadth	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
eal-77			
real	0	34	19
cereal	0	1	3
montreal	0	0	1
zealand	0	14	0
jealous	0	5	0
ear-136			
year	3	41	25
bear	0	6	7
search	20	20	0
nuclear	0	1	2
heart	0	8	0
rearrange	0	3	0
eas-111			
whereas	0	3	0
areas	0	0	3
peas	13	44	4
pleasant	0	18	0
cease	0	21	0
breast	0	4	0
eat-110			
great	0	18	0
heat	3	24	19
threat	0	8	3
death	0	16	0
beneath	0	0	4
creation	0	13	0
ect-245			
detect	0	134	54
section	0		0
connecticut	0	1	0
imperfect	0	0	2
ely-114			
lively	0	0	112
rely	0	1	1
enc-170			
indifference	0	111	0
encampment	17	1	0
french	0	8	0
agencies	0	33	0

Trigrams - Alphabet List

	Initial	Medial	Final
end-162			
attend	19	101	41
fiend	0	0	1
ens-128			
dozens	4	79	20
queens	0	19	4
ensemble	2	0	0
ent-719			
went, student (cannot distinguish)	13	180	427
entail	18	28	0
nineteenth	0	4	0
seventh	0	4	4
essential	0	51	0
era-164			
opera	0	151	4
era(whereabouts)	2	7	0
ere-218			
were	0	47	45
there	0	25	10
here	0	8	23
reread	4	7	0
indifference	0	14	0
reverend	0	27	0
interest	0	8	0
ern-76			
lantern	1	37	20
alternate	0	18	0
ers-414			
summers	0	0	275
versa	0	106	0
tiers	0	3	10
leadership	0	20	0
ert-104			
concert	0	40	18
certain	0	43	0
berth	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
ess-347			
less	0	134	170
pressure	0	37	0
necessary	0	3	0
essential	0	2	0
dessert	0	1	0
est-280			
west	9	131	102
restatement	8	28	0
priest	0	0	2
ete-103			
complete	0	29	8
detect	0	48	0
coveted	0	15	3
eve-120			
believe	2	24	3
reveal	0	27	0
level	10	45	0
seven	0	9	0
exp-100			
expand	92	8	0
fer-79			
offer	9	47	17
interfere	0	5	0
ferry	0	1	0
fic-87			
specific	2	38	6
superficially	0	36	0
sacrifice	0	4	0
efficacy	0	1	0
for-174			
forage	51	54	0
force	43	26	0
ful-90			
powerful	9	28	53

Trigrams - Alphabet List

	Initial	Medial	Final
ged-69			
engaged	0	0	50
rugged	0	0	16
tagged	0	0	3
gen-88			
oxygen	34	36	8
copenhagen	0	0	1
Gene	4	5	0
ger-74			
larger	7	13	18
longer	0	10	22
singer	0	1	2
algerian	0	1	0
ges-76			
changes	3	13	55
biggest	0	5	0
gin-90			
begin	0	4	2
origin	1	57	5
vagina	0	1	0
singing	0	20	0
gra-163			
grant	41	18	0
grace	26	10	0
integral	17	50	1
gre-76			
grease	25	27	0
grenade	2	20	0
grew	1	0	0
grey	1	0	0
har-88			
character	1	19	0
harbor	32	36	0

Trigrams-Alphabet List

	Initial	Medial	Final
hea-77			
anthea	0	0	2
head	28	9	0
sheaf	14	14	0
heard	1	5	0
theater	0	4	0
her-187			
teacher	5	37	66
whereabouts	2	42	0
peripheral	0	1	0
herb	8	14	0
adhered	9	3	0
hin-116			
within	8	39	7
china	0	11	0
machine	0	51	0
hor-77			
author	20	50	7
ial-124			
social	0	42	78
trial	0	0	1
ian-99			
Russian	0	6	33
Indian	0	10	34
alliance	0	13	0
Lousiana	0	3	0
ica-247			
America	0	107	4
American	0	66	0
barricade	0	67	0
chicago	0	2	0
superficially	0	1	0
ice-77			
service	0	12	21
voice	0	1	4
price	3	9	20
juice	0	0	1
monticello	0	5	0
police	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
ick-64			
quick	0	40	24
ide-163			
side	17	26	60
aide	0	2	2
avoided(ideology)	3	17	0
millidegree (evidence)	0	36	0
ied-71			
tried	0	0	53
carried	0	0	18
ies-217			
entries	0	0	187
supplies	0	0	20
acquiesce	0	0	20
priest	0	2	0
ile-84			
while	0	16	26
missile	0	0	10
detailed	0	3	12
boiled	0	6	0
privelege	0	8	0
automobile	0	0	3
ili-126			
chili	0	94	0
smiling	0	7	0
civilization	0	12	0
utilize	0	13	0
ill-145			
will	21	89	34
parillo (i yo, span.)	0	1	0
imp-91			
limp	73	16	2

Trigrams - Alphabet List

	Initial	Medial	Final
ina-126			
China	10	36	4
marina	0	1	3
finance	0	11	0
eliminate	0	61	0
inc-102			
zinc	2	0	1
incapable	50	11	0
since	7	32	0
ind-125			
kind	0	18	20
indebted	72	15	0
ins-140			
grains	86	8	46
ire-85			
fire	1	29	32
questionaire	0	4	3
direct	0	16	0
ism-71			
communism	0	0	63
dismal	8	0	0
ine-239			
fine	0	131	57
determine	0	39	17
maine	0	26	1
marine	0	7	15
happiness	9	13	0
ineffective	2	6	1
business	4	5	0
joiner	0	5	0
Chinese	0	1	0
ing-1554			
impinging	2	0	12
sing	0	73	1464
ingredient	3	0	0

Trigrams - Alphabet List

	Initial	Medial	Final
int-226			
intake	138	10	0
print	0	7	13
paint	0	20	11
point	0	13	10
pint	0	0	1
uncertainties	0	1	0
ninth	0	1	0
Corinthian	0	1	0
ion-1026			
region	0	138	856
union	0	0	17
million	0	0	17
lion(2)	4	8	0
espionage	0	1	0
ish-121			
wish	0	74	46
mishap	0	1	0
ist-304			
list	1	187	104
moist	0	1	0
waist	0	1	9
moisture	0	1	0
bristle	0	8	0
Christ	0	1	0
ite-123			
white	3	19	43
opposite	0	42	10
suite	0	0	3
architect	0	3	0
ity-203			
utility	0	0	203
ive-280			
give	0	84	138
five	0	36	10
receive	0	8	3
naive	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
ize-98			
size (2)	0	59	32
citizen	0	4	0
seized	0	1	0
ked-81			
marked	0	0	77
naked	0	3	1
kin-98			
king	5	69	0
skin	5	2	10
kind	3	0	4
lan-115			
plan	16	57	3
balance	0	31	0
plane	2	6	0
lar-96			
particular	0	4	39
clarity	2	28	0
alarm	6	7	0
lat-162			
flat	7	29	2
late	5	119	0
lea-83			
plea	31	37	2
pleasant	1	6	0
learn	4	0	0
mileage	0	2	0
led-166			
detailed	0	0	153
led	3	6	4
len-77			
fallen	9	57	8
lenient	1	2	0

Trigrams - Alphabet List

	Initial	Medial	Final
ler-75			
smaller	0	30	45
les-196			
less	0	132	0
mules	0	13	42
adolescent	0	6	0
congolese	0	1	0
flesh	0	1	0
wholesale	0	1	0
lic-91			
public	2	39	18
policies	0	20	0
slice	4	2	0
police	0	4	0
cliche	0	2	0
lin-232			
Berlin	9	13	8
Carolina	0	11	0
inclination	0	2	0
line	0	12	18
lonliness	0	4	0
leveling	1	139	0
linkage	6	9	0
lit-143			
split	13	114	2
polite	1	8	0
elite	0	1	0
militia	0	4	0
man-142			
German	0	11	40
manage	54	26	6
humane	2	3	0
mar-89			
mar(1)	40	14	0
grammar	0	3	1
mare	12	8	0
marina	6	4	0

Trigrams - Alphabet List

	Initial	Medial	Final
med-92			
seemed	0	0	67
medal	8	4	0
immediately	6	0	6
someday	0	1	0
men-326			
men(2)	11	275	37
men's			
sameness	0	1	0
mer-89			
former	15	25	29
america	5	8	0
camera	0	4	0
mere	0	3	0
min-201			
famine	25	98	2
coming	2	54	0
mine	14	6	0
mis-90			
promise	32	21	0
mission	4	15	0
misery	5	2	0
demise	0	1	0
mon-79			
common	12	23	10
monster	23	2	0
testimony	1	8	0
nal-145			
personal	0	45	85
canal	0	13	1
unallowable	0	1	0
nat-144			
sonata	0	2	0
snatch	11	11	0
fortunate	0	32	0
eliminate	10	78	0

Trigrams - Alphabet List

	Initial	Medial	Final
nds-72			
hands	0	10	62
ned-161			
dampened	0	0	160
benediction	0	1	0
ner-112			
dinner	4	45	63
nin-142			
learning	0	130	0
nine	6	0	0
feminine	0	2	2
uninhabited	0	2	0
nis-84			
tennis	0	39	0
communism	0	15	0
finish	0	29	0
Tunisia	0	1	0
nit-75			
unit	0	53	2
unite	0	4	0
initial	0	15	0
zenith	0	1	0
omm-81			
(c always precede)			
see comm			
omp-139			
compact	0	134	0
prompt	0	5	0
one-125			
one	4	0	8
alone	0	47	9
gone	0	11	2
done	0	42	0
sooner	0	2	0
ons-425			
sections	0	64	275
balloons	0	64	275
protons	0	75	2

Trigrams - Alphabet List

	Initial	Medial	Final
ont-124			
front	0	12	5
contract	2	104	1
ord-70			
orders	12	31	17
word	0	2	7
cordial	0	1	0
ore-116			
store	2	61	44
foreign	0	9	0
ori-113			
memorial	5	42	0
original	9	42	0
meteorites	0	15	0
orm-85			
form	0	62	21
worm	0	0	2
ors-111			
colors	0	9	82
doors	0	15	5
ort-177			
short	0	69	53
orthodox	9	14	0
portion	0	11	0
effort	0	6	5
worthy	0	7	0
mortgage	0	2	0
rapport	0	0	1
ose-78			
those	0	20	26
close	0	2	7
whose	0	5	0
purpose	0	2	2
goose	0	3	3

Trigrams - Alphabet List

	Initial	Medial	Final
oun-147			
announce	2	126	4
wound	0	15	0
(young)			
our-90			
courage	2	38	0
four	0	27	5
our (2)	1	4	4
ours			
tour	0	1	4
behavior			2
ous-214			
various	0	42	131
house	0	19	0
arousal	1	15	1
cousin	0	2	0
acoustical	0	1	0
limousine	0	1	0
Houston	0	1	0
out			
out(1)	48	9	20
south	0	12	0
youth	0	5	0
Southern	0	4	0
ove-158			
love (above)	1	39	6
drove	49	14	6
prove	0	14	12
novel	0	16	0
par-142			
party	49	42	0
prepare	28	23	0

Trigrams - Alphabet List

	Initial	Medial	Final
pec-84			
special	0	11	0
expect	1	53	0
specify	0	10	0
specific	0	4	0
peculiar	0	3	0
species	0	2	0
ped-86			
developed	0	0	75
pedal	5	2	0
stampede	0	4	0
pen-88			
pen(1)	23	60	4
per-234			
paper	83	74	42
imperative	0	2	0
imperial	13	20	0
pin-86			
helping	0	67	0
pin (2)	4	6	0
pins			
happiness	0	3	0
pine	3	1	0
pla-122			
implacable	10	1	0
place	30	40	0
plan	24	13	0
applaud	1	3	0
por-96			
porch	22	72	0
vapor	0	0	2
pos-108			
suppose	12	53	0
posts	15	1	0
opposite	6	8	0
purposes	0	4	0
possible	8	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
pre-218			
preach	92	26	0
spread	47	49	0
pretty	3	0	0
prey	1	0	0
pri-90			
price	19	20	0
spring	24	17	0
appropriate	2	7	0
upright	0	1	0
pro-285			
approach	114	19	6
problem	82	11	0
proof	6	15	0
apron	0	1	0
proud	2	2	0
rac-125			
race	5	20	0
terrace	0	12	0
rack	4	78	0
tetrachloride	0	6	0
rad-73			
grade	16	21	0
gradually	5	17	0
cradle	0	14	0
rai-72			
rain	19	52	0
prairie	0	1	0
ral-102			
mineral	0	27	57
morale	0	11	0
overall	0	4	0
parallel	0	3	0
ran-177			
ran	7	94	1
verteran	0	33	2
rancor	5	12	0
membrane	4	17	0
orange	0	2	0

Trigrams - Alphabet List

	Initial	Medial	Final
rap-79			
trap	7	13	6
grape	0	10	0
telegraph	0	42	0
parapsychology	0	1	0
rat-276			
rate	5	92	0
accurate	0	23	0
rat(2)	5	15	1
rats			
fraternity	0	27	0
scratch	0	10	0
strategic	0	1	0
strategy	0	3	0
wrath	0	2	0
ingratiating	2	79	0
rational	8	1	0
rea-213			
reach	25	73	0
spread	5	37	0
react	19	4	0
break	0	15	0
create	0	13	0
area	7	2	3
thereafter	0	5	0
bureau	0	4	0
acreage	0	1	0
rec-150			
record	28	31	0
recall	56	35	0
ree-75			
three	0	58	17
ren-114			
children	9	80	5
renew	5	3	2
strength	0	6	0
weren't	0	1	0
awareness	0	2	0
rendezvous	1	0	0
rep-85			
repair	53	7	0
crept	14	9	0
fireplace	0	1	0
entrepreneur	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
ric-93			
electric	0	56	19
price	0	6	0
rich	6	2	0
electric	0	56	19
agriculture	0	2	0
ric-116			
carried	0	51	51
fried	0	12	2
rin-225			
during	1	171	0
grin	2	36	0
marina	0	11	0
grinder	0	4	0
rit-123			
spirit	6	86	0
write	1	23	0
arithmetic	0	6	0
espirit	0	1	0
ron-72			
iron	0	29	8
electron	0	17	3
throne	0	4	0
strong	0	8	0
pronoun	0	3	0
coroner	0	2	0
rop-79			
rope	2	30	0
drop	0	22	6
prophet	0	5	0
microphone	0	11	0
Europe	0	3	0
rou-95			
trouble	3	28	0
crouch	8	31	0
thoroughly	1	6	0
brought	0	4	0
through	0	14	0

Trigrams - Alphabet List

	Initial	Medial	Final
sed-118			
used	3	0	113
seduction	1	1	0
sen-86			
chosen	0	24	0
send	34	23	3
senior	1	1	0
ser-92			
closer	16	16	3
composer	0	35	12
serum	6	1	0
reservoir	0	2	0
sergaent	1	0	0
ses-124			
cases	2	16	106
sin-128			
sin	12	11	6
housing	11	87	0
sine	1	0	0
sit-81			
sit(2)	7	23	
sits			
visit	0	20	5
position	0	23	
site	0	3	0
son-76			
son (3)	1	14	19
sons			
son's			
reason	0	17	10
ultrasonic	3	6	0
song	2	0	0
sonar	1	0	0
spe-123			
speak	17	3	0
special	41	37	0
spend	3	22	0

Trigrams - Alphabet List

	Initial	Medial	Final
spo-78			
spoke	16	16	0
response	16	23	0
spoon	1	5	0
sponge	1	0	0
sta-231			
establish	33	56	0
stable	49	29	0
star	17	2	0
stalk	7	19	0
stability	5	4	2
obstacles	0	3	0
mustard	0	2	0
restaurant	0	2	0
ste-239			
taste	35	172	6
trustee	9	4	0
listen	0	13	0
sti-230			
drastic	0	205	0
celestial	0	15	0
stir	0	4	0
prestige	0	3	0
pastime	0	2	0
Christianity	0	1	0
str-257			
strain	108	149	0
sts-75			
costs	0	1	74
sur-79			
surprise	33	9	0
sur(1)			
insurance	2	15	0
measure	0	19	0
tal-133			
total	0	22	54
tale	2	1	0
talent	5	27	0
talk	6	16	0

Trigrams - Alphabet List

	Initial	Medial	Final
tan-110			
tan	9	67	9
distance	0	16	0
tangled	0	7	0
debutante	0	1	0
tar-76			
military	1	42	0
tar	5	16	5
motor	0	4	3
tat-138			
habitat	1	19	3
hesitate	0	115	3
tch-85			
watch	0	40	45
ted-477			
parted	0	8	478
tedious	1	0	0
ten-191			
ten(1)	30	87	0
written	0	21	23
often	0	25	23
politeness	0	2	0
ter-501			
water	10	237	206
austere	4	22	0
stero	11	11	0
tes-129			
states	0	3	87
diabetes	0	1	1
shortest	9	28	0
tic-244			
drastic	1	72	127
justice	0	41	0
politician	0	2	0
ticonderoga	1	0	0

Trigrams - Alphabet List

	Initial	Medial	Final
tur-149			
natural	0	111	0
turbine	19	19	0
ual-72			
usual	0	28	32
equal	0	9	2
squali	0	1	0
und-141			
sound	0	36	17
fund	53	28	2
wound	0	2	1
laundry	0	2	0
ure-162			
nature	1	78	78
poured	0	3	0
laurel(aureoluycin)	0	2	0
ust-113			
must	0	77	21
austere	0	7	1
locust	0	4	1
Houston	0	1	0
oust	0	1	0
vel-85			
level	0	62	13
lovely	0	34	0
ven-95			
even	14	54	14
convenient	1	6	0
forgiveness	0	6	0
ver-268			
over	23	190	46
very	5	1	0
revered	0	3	0
ves-95			
gives	0	0	72
investigation	4	19	0
livestock	0	1	0

Trigrams - Alphabet List

	Initial	Medial	Final
tie-95			
tie(2)	1	0	0
ties			
cities	1	80	1
patient	0	8	0
pertinent	0	1	0
prettiest	0	2	0
tin-363			
martin	0	42	9
resting	1	10	284
martini	1	8	0
platinum	0	3	0
tiny	1	2	0
itinery	0	1	0
tiv-155			
festival	0	155	0
tor-218			
doctor	39	48	42
storage	15	73	0
satisfactorily	0	1	0
tra-290			
orchestra	6	26	4
trace	27	88	0
track	79	58	0
straw	0	2	0
tly-86			
exactly	0	0	86
tre-81			
stress	15	29	0
streak	13	22	
theatre	0	0	1
outreach	0	1	0
tri-152			
industrial	1	24	0
triad	20	17	0
contribute	18	69	0
outright	0	2	0
tru-72			
truck	14	44	0
true	8	6	0

Trigrams - Alphabet List

	Initial	Medial	Final
war-90			
war(3)	30	16	1
wars			
wars'			
toward	0	29	0
aware	3	8	0

Trigrams - Rank List

	Initial	Medial	Final
ing-1554			
impinge	0	2	12
sing	0	73	1464
ingredient	3	0	0
ion-1026			
region	0	138	856
union	0	0	17
million			
lion(2)	4	8	0
espionage	0	1	0
ent-719			
went	13	170	427
student			
(cannot distinguish)			
entail	18	28	0
nineteenth	0	4	0
seventh	0	4	4
essential	0	51	0
ter-501			
water	10	236	206
austere	4	22	0
stereo	11	11	0
ted-477			
parted	0	8	468
tedious	1	0	0
ate-467			
ate(1)	0	175	159
immediate	0	25	47
threaten	0	6	0
repeated	0	11	0
floated	0	3	0
strategic	0	1	0
strategy	0	12	0
quatemala	0	1	0
water	0	15	0
material	0	5	0
maternal	0	4	0
whatever	0	1	0
extraterestial	0	1	0
con-430			
bacon	253	40	4
con(1)	113	16	0
cone	3	0	0

Trigrams - Rank List

	Initial	Medial	Final
ons-425			
sections	0	64	275
balloons	1	1	8
protons	0	75	2
ers-414			
summers	0	0	275
versa	0	106	0
tiers	0	3	10
leadership	0	20	0
tin-363			
martin	0	42	9
resting	1	10	284
martini	1	8	0
platinum	0	3	0
tiny	1	2	0
itinery	0	1	0
ess-347			
less	0	134	170
pressure	0	37	0
necessary	0	3	0
essential	0	2	0
dessert	0	1	0
men-326			
men	11	275	37
men's			
sameness	0	1	0
ist-304			
list	1	187	104
moist	0	1	0
waist	0	1	0
moisture	0	1	0
bristle	0	8	0
Christ	0	1	0
tra-290			
orchestra	6	26	4
trace	27	88	0
track	79	58	0
straw	0	2	0

Trigrams - Rank List

	Initial	Medial	Final
pro-285			
approach	147	19	0
problem	82	11	0
proof	6	15	0
apron	0	1	0
proud	2	2	0
est-280			
west	9	131	102
restatement	8	28	0
priest	0	0	2
ive-280			
give	0	84	138
five	0	36	10
receive	0	8	3
naive	0	1	0
rat-276			
rate	5	92	0
accurate	0	23	0
rat(2)	5	15	1
rats			
fraternity	0	27	0
scratch	0	10	0
strategic	0	1	0
strategy	0	3	0
wrath	0	2	0
ingratiating	8	79	0
rational	8	1	0
all-275			
ballad	19	167	0
all(1)	0	28	36
ballistic	12	10	0
shall	0	0	2
ver-268			
over	23	190	46
very	5	1	0
revered	0	3	0
com-262			
come	147	39	0
combat	61	13	0
comb	2	0	0

Trigrams - Rank List

	Initial	Medial	Final
str-257			
strain	108	149	0
ble-256			
possible	0	21	213
bleached	5	0	0
problem	9	7	0
blew	1	0	0
ica-247			
america	0	107	4
american	0	66	0
barricade	0	67	0
chicago	0	2	0
superficially	0	1	0
ect-245			
detect	0	134	54
section	0	54	0
connecticut	0	1	0
imperfect	0	2	0
tic-244			
drastic	0	72	127
justice	0	41	0
politician	0	2	0
ticonderoga	1	0	0
ant-242			
ant(1)	31	56	14
meant	11	3	10
want	0	10	4
substantial	0	2	0
meantime	0	1	0
ine-239			
fine	0	31	57
determine	0	39	17
maine	0	26	1
marine	0	7	15
happiness	9	13	0
ineffective	2	6	1
business	4	5	0
joiner	0	5	0
Chinese	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
ste-239			
taste	35	172	6
trustee	9	4	0
listen	0	13	0
per-234			
paper	83	74	42
imperative	0	2	0
imperial	13	20	0
lin-232			
Berlin	9	13	8
Carolina	0	11	0
inclination	0	2	0
line	0	12	18
lonliness	0	4	0
leveling	1	139	0
linkage	6	9	0
sta-231			
establish	33	56	0
stable	49	29	0
star	17	2	0
stalk	17	2	0
stability	5	4	2
obstacles	0	3	0
mustard	0	2	0
restaurant	0	2	0
sti-230			
drastic	0	205	0
celestial	0	15	0
stir	0	4	0
prestige	0	3	0
pastime	0	2	0
Christianity	0	1	0
int-226			
intake	138	10	0
print	0	7	13
paint	0	20	11
point	0	13	10
pint	0	0	1
uncertainties	0	1	0
ninth	0	1	0
corinthian	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
rin-225			
during	1	171	0
grin	2	36	0
marina	0	11	0
grinder	0	4	0
ere-218			
were	0	47	45
there	0	25	10
here	0	8	23
reread	4	7	0
indifference	0	14	0
reverend	0	27	0
interest	0	8	0
pre-218			
preach	92	26	0
spread	47	49	0
pretty	3	0	0
prey	1	0	0
tor-218			
doctor	39	48	42
storage	15	73	0
satisfactorily	0	1	0
ies-217			
entries	0	0	187
supplies	0	0	20
acquiesce	0	8	0
priest	0	2	0
ous-214			
various	0	42	131
house	0	19	0
arousal	1	15	1
cousin	0	2	0
acoustical	0	1	0
limousine	0	1	0
Houston	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
rea-213			
reach	25	73	0
spread	5	37	0
react	19	4	0
break	0	15	0
create	0	13	0
area	7	2	3
thereafter	0	5	0
bureau	0	4	0
acreage	0	1	0
der-208			
slender	1	66	134
derision	5	0	0
derivation	2	0	0
ity-203			
utility	0	0	203
min-201			
famine	25	98	2
coming	2	54	0
mine	14	6	0
les-196			
less	0	132	0
mules	0	13	42
adolescent	0	6	0
congolese	0	1	0
flesh	0	1	0
wholesale	0	1	0
cal-193			
musical	0	53	96
calmity	1	0	0
calcium	23	8	0
call	6	2	0
scalp	2	2	0
ten-191			
ten(1)	30	87	0
written	0	21	23
often	0	25	2
politeness	0	2	0

Trigrams - Rank List

	Initial	Medial	Final
her-187			
teacher	5	37	66
whereabouts	2	42	0
perpherial	0	1	0
herb	8	14	0
adhered	9	3	0
abl-186			
capable	2	163	0
enabled	0	12	0
establish	0	7	0
and-186			
brand	1	124	29
island	0	9	18
wander	0	5	0
ort-177			
short	0	69	53
orthodox	9	14	0
portion	0	11	0
effort	0	6	5
worthy	0	7	0
mortgage	0	2	0
rapport	0	0	1
ran-177			
ran	7	94	1
veteran	0	33	2
rancor	5	12	0
membrane	4	17	0
orange	0	2	0
for-174			
forage	51	53	0
force	43	26	0
enc-170			
indifference	0	111	0
encampment	17	1	0
french	0	8	0
agencies	0	33	0
ain-168			
certain	0	5	22
maintain	1	92	48

Trigrams - Rank List

	Initial	Medial	Final
din-168			
cardinal	3	21	0
dined	2	0	0
readiness	0	1	0
deciding	1	140	0
led-166			
detailed	0	0	153
led	3	6	4
era-164			
opera	0	151	4
era	2	7	0
gra-163			
grant	41	18	0
grace	26	10	0
integral	17	50	1
ide-163			
side	17	26	60
aide	0	2	2
avoided (ideology)	3	17	0
millidegree (evidence)	0	36	0
end-162			
attend	19	101	41
fiend	0	0	1
lat-162			
flat	7	29	2
late	5	119	0
ure-162			
nature	1	78	78
poured	0	3	0
laurel (aureomycin)	0	2	0

Trigrams - Rank List

	Initial	Medial	Final
ned-161			
dampened	0	0	160
benediction	0	1	0
ove-158			
love	1	39	6
drove	49	14	6
prove	0	14	12
novel	0	16	0
age-156			
stage	7	11	15
average	1	26	83
garage	0	0	7
eager	3	1	0
Copenhagen	0	1	0
Almagest	0	1	0
anc-156			
chance	4	52	0
distance	0	90	0
anchor	2	7	0
ancient	1	0	0
tiv-155			
festival	0	155	0
tri-152			
industrial	2	24	0
triad	20	17	0
contribute	18	69	0
outright	0	2	0
rec-150			
record	28	31	0
recall	56	35	0
tur-149			
natural	0	111	0
turbine	19	19	0
ast-148			
last	10	73	24
least	0	5	7
coast	0	5	5
waste	0	19	0

Trigrams - Rank List

	Initial	Medial	Final
act-147			
factors	20	102	25
oun-147			
announce	2	126	4
wound	0	15	0
(young)			
ill-145			
will	21	89	34
parillo	0	1	0
(i yo, span.)			
nal-145			
personal	0	45	85
canal	0	13	1
unallowable	0	1	0
nat-144			
sonata	0	2	0
(not)			
snatch	11	11	0
fortunate	0	32	0
eliminate	11	78	0
lit-143			
split	13	114	2
polite	1	8	0
elite	0	1	0
militia	0	4	0
man-142			
German	0	11	40
manage	54	26	6
humane	2	3	0
nin-142			
learning	0	130	0
nine	6	0	0
feminine	0	2	2
uninhabited	0	2	0

Trigrams - Rank List

	Initial	Medial	Final
ari-141			
variable (wearing)	3	97	0
marina	0	36	0
arise	3	0	0
sparing	0	2	0
und-141			
sound	0	36	17
fund	53	28	2
wound	0	2	1
laundry	0	2	0
ins-140			
grains	86	8	46
omp-139			
compact	0	134	0
prompt	0	5	0
art-136			
part	28	76	16
quart	0	10	1
dearth	2	3	2
tat-138			
habitat	1	19	3
hesitate	0	115	0
ard-136			
toward	4	48	84
ear-136			
year	3	41	25
bear	0	6	7
search	20	20	0
nuclear	0	1	2
heart	0	8	0
rearrange	0	3	0
cat-135			
cat	30	2	2
indicate	3	90	0
delicate	0	7	0
staccato	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
ass-133			
class	64	24	37
compass	0	4	4
tal-133			
total	0	22	54
tale	2	1	0
talent	5	27	0
talk	6	16	0
ces-132			
chances	0	49	80
indices	0	1	2
tes-129			
states	0	3	87
diabetes	0	1	1
shortest	9	28	0
ens-128			
dozens	4	79	20
queens	0	19	4
ensemble	2	0	0
sin-128			
sin	12	11	6
horsing	11	87	0
sine	11	0	0
app-127			
appalling	72	55	0
ded-126			
needed	2	1	115
deduce	8	0	0
ili-126			
chili	0	94	0
smiling	0	7	0
civilization	0	12	0
utilize	0	13	0

Trigrams - Rank List

	Initial	Medial	Final
ina-126			
china	10	36	4
marina	0	1	3
finance	0	11	0
eliminate	0	61	0
ind-125			
kind	0	18	20
indebted	72	15	0
one-125			
one	4	0	8
alone	0	47	9
gone	0	11	2
done	0	42	0
sooner	0	2	0
rac-125			
race	5	20	0
terrace	0	12	0
rack	4	78	0
tetrachloride	0	6	0
ial-124			
social	0	42	78
trial	0	0	4
out-124			
front	0	12	5
contract	2	104	1
ses-124			
cases	2	16	106
ite-123			
white	3	19	43
opposite	0	42	10
suite	0	0	3
architect	0	3	0
spe-123			
speak	17	3	0
special	41	37	0
spend	3	22	0

Trigrams - Rank List

	Initial	Medial	Final
rit-123			
spirit	6	86	0
write	1	23	0
arithmetic	0	6	0
esprit	0	1	0
pla-122			
implacable	10	0	1
place	30	40	0
plan	24	13	0
applaud	1	3	0
aus-120			
plans	4	70	38
cleansing	0	1	0
beans	0	0	6
loans	0	0	1
eve-120			
believe	2	24	3
reveal	0	27	0
level	10	45	0
seven	0	9	0
ish-121			
wish	0	74	46
mishap	0	1	0
sed-118			
used	3	0	113
seduction	1	1	0
ore-116			
store	2	61	44
foreign	0	9	0
hin-116			
within	8	39	7
china	0	11	0
machine	0	51	0
rie-116			
carried	0	51	51
fried	0	12	2

Trigrams - Rank List

	Initial	Medial	Final
lan-115			
plan	16	57	3
balance	0	31	0
plane	2	6	0
ely-114			
lively	0	0	112
rely	0	1	1
ren-114			
children	9	80	5
renew	5	3	2
strength	0	6	0
weren't	0	6	0
awareness	0	2	0
rendezvous	1	0	0
ori-113			
memorial	5	42	0
original	9	42	0
meteorites	0	15	0
ust-113			
must	0	77	21
austere	0	7	1
locust	0	4	1
Houston	0	1	0
oust	0	1	0
ner-112			
dinner	4	45	63
eas-111			
whereas	0	3	1
areas	0	0	3
peas	13	44	4
pleasant	0	18	0
cease	0	21	0
breast	0	4	0
ors-111			
colors	0	9	82
doors	0	15	5

Trigrams - Rank List

	Initial	Medial	Final
eat-110			
great	0	18	0
heat	3	24	19
threat	0	8	3
death	0	16	0
beneath	0	0	0
creation	0	13	0
des-110			
insides	59	17	34
tan-110			
tan(1)	9	67	9
distance	0	16	0
tangled	0	7	0
debutante	0	1	0
pos-108			
suppose	12	53	0
posts	15	1	0
opposite	6	8	0
purposes	0	4	0
possible	8	1	0
are-104			
are	3	5	0
care	45	2	35
cleared	0	12	0
soared	0	2	0
ert-104			
concert	0	40	18
certain	0	45	0
berth	0	1	0
ete-103			
complete	0	29	8
detect	0	48	0
coveted	0	15	3
inc-102			
zinc	2	0	1
incapable	50	11	0
since	7	32	0

Trigrams - Rank List

	Initial	Medial	Final
ral-102			
mineral	0	27	57
morale	0	11	0
overall	0	4	0
parallel	0	3	0
chi-101			
hibachi	0	1	1
bronchial	4	9	0
psychiatrist	0	4	0
chick	10	1	0
chicago	2	4	0
chief	17	4	0
china	5	0	0
children	10	29	0
exp-100			
expand	92	8	0
ani-99			
pennsylvania	0	2	3
organic	0	88	0
meaning	0	6	0
att-99			
attach	53	46	0
ian-99			
Russian	0	6	33
Indian	0	10	34
alliance	0	13	0
Louisiana	0	3	0
out-99			
south	0	12	0
out(1)	48	9	20
youth	0	5	0
southern	0	4	0
ize-98			
size	0	59	32
sizes(2)			
citizen	0	4	0
seized	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
kin-98			
king	5	69	0
skin	5	2	10
kind	3	0	4
lar-96			
particular	0	14	39
clarity	2	28	0
alarm	6	7	0
por-96			
porch	22	72	0
vapor	0	0	2
rou-95			
trouble	3	28	0
crouch	8	31	0
thoroughly	1	6	0
brought	0	4	0
through	0	14	0
tie-95			
tie(2)	1	0	0
ties			
cities	1	80	1
patient	0	8	0
pertinent	0	1	0
prettiest	0	2	0
ven-95			
even	14	54	14
convenient	1	6	0
forgiveness	0	6	0
ves-95			
gives	0	0	72
investigation	4	18	0
livestock	0	1	0
ric-93			
electric	0	56	19
price	0	6	0
rich	6	2	0
electricty	0	2	0
agriculture	0	2	0

Trigrams - Rank List

	Initial	Medial	Final
ser-92			
closer	16	16	3
composer	0	35	12
serum	6	1	0
reservoir	0	2	0
sergeant	1	0	0
med-92			
seemed	0	0	67
medial	8	4	0
immediately	6	0	6
someday	0	1	0
imp-91			
limp	73	16	2
lic-91			
public	2	29	18
policies	0	20	0
slice	4	2	0
police	0	4	0
cliche	0	2	0
cor-90			
decor	53	35	2
ful-90			
powerful	9	28	53
gin-90			
begin	0	4	2
origin	1	57	5
vagina	0	1	0
singing	0	20	0
mis-90			
promise	32	31	0
mission	4	15	0
misery	5	2	0
demise	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
our-90			
courage	2	38	0
four	0	27	5
our(2)	1	4	4
ours			
tour	0	1	4
behavior	0	0	2
pri-90			
price	19	20	0
spring	24	17	
appropriate	2	7	
upright	0	1	0
war-90			
war(3)	30	16	1
wars			
wars'			
toward	0	29	0
aware	3	8	0
ack-89			
back	0	50	39
mar-89			
mar(1)	40	14	0
grammar	0	3	1
mare	12	8	0
marina	6	4	0
mer-89			
former	14	25	29
america	5	8	0
camera	0	4	0
mere	0	3	0
gen-88			
oxygen	34	36	8
copenhagen	0	0	1
gene	4	5	0
har-88			
character	1	19	0
harbor	32	36	0

Trigrams - Rank List

	Initial	Medial	Final
pen-88			
pen(1)	23	60	4
fic-87			
specific	2	38	0
superficially	0	36	0
sacrifice	0	4	0
efficacy	0	1	0
cen-86			
innocence	21	61	0
scene	0	4	0
ped-86			
developed	0	0	75
pedal	5	2	0
stampede	0	4	0
pin-86			
helping	0	67	0
pin(2)	4	6	0
pins			
happiness	0	3	0
pine	3	1	0
sen-86			
chosen	0	24	0
send	34	23	3
senior	1	1	0
tly-86			
exactly	0	0	80
ace-85			
place	2	22	32
surface	0	2	14
peace	0	3	1
academically	0	9	0
ire-85			
fire	1	29	32
questionaire	0	4	3
direct	0	16	0

Trigrams - Rank List

	Initial	Medial	Final
orm-85			
form	0	62	61
worm	0	0	2
rep-85			
repair	53	7	0
crept	14	9	0
fireplace	0	1	0
entrepreneur	0	1	0
vel-85			
level	0	62	13
lovely	0	34	0
ang-84			
sang	8	20	9
change	1	46	0
cre-84			
acre	0	0	3
acreage	31	50	0
ile-84			
while	0	16	26
missile	0	0	10
detailed	0	3	12
boiled	0	6	0
privilege	0	8	0
automobile	0	0	3
nis-84			
tennis	0	29	0
communism	0	15	0
finish	0	29	0
tunisia	0	1	0
pec-84			
special	0	11	0
expect	1	53	0
specify	0	10	0
specific	0	4	0
peculiar	0	3	0
species	0	2	0

Trigrams - Rank List

	Initial	Medial	Final
car-83			
car	34	7	5
oscar	2	0	2
caravan	26	7	0
lea-83			
plea	31	37	2
pleasant	1	6	0
learn	4	0	0
mileage	0	2	0
ked-81			
marked	0	0	77
naked	0	3	1
omn-81			
(c always precedes)			
see comm			
sit-81			
sit	7	23	0
sits			
visit	0	20	5
position	0	23	0
site	0	3	0
tre-81			
stress	15	29	0
streak	13	22	0
theatre	0	0	1
outreach	0	1	0
ail-79			
prevail	2	42	33
thailand	0	1	0
superficially	0	1	0
ake-79			
mistake	0	26	33
chesapeake	0	14	1
naked	0	2	0
soaked	0	2	0
nutcracker	0	1	0

Trigrams - Rank List

	Initial	Medial	Final
ame-79			
same	0	11	22
madame	0	0	1
dreamed	0	6	0
foamed	0	1	0
amended	12	26	0
ber-79			
number	7	37	32
siberia	1	2	0
fer-79			
offer	9	47	17
interfere	0	5	0
ferry	0	1	0
mon-79			
common	12	23	10
monster	23	2	0
testimony	1	8	0
rap-79			
trap	7	13	6
grape	0	10	0
telegraph	0	42	0
parapsychology	0	1	0
rop-79			
rope	2	30	0
drop	0	22	6
prophet	0	5	0
microphone	0	11	0
Europe	0	3	0
sur-79			
surprise	33	9	0
sur(1)			
insurance	0	19	0
measure	2	15	0

Trigrams - Rank List

	Initial	Medial	Final
ose-78			
those	0	20	26
close	0	2	7
whose	0	5	0
purpose	0	3	3
goose		3	3
prosecuted	0	7	0
spo-78			
spoke	16	16	0
response	16	23	0
spoon	1	5	0
sponge	1	0	0
ary-77			
rotary	0	0	12
wary	1	2	62
eal-77			
real	0	34	19
cereal	0	1	3
montreal	0	0	1
zealand	0	14	0
jealous	0	5	0
hea-77			
anthea	0	0	2
head	28	9	0
sheaf	14	14	0
heard	1	5	0
theater	0	4	0
hor-77			
author	20	50	7
ice-77			
service	0	12	21
voice	0	1	4
price	3	9	20
juice	0	0	1
monticello	-	5	-
police	-	1	-
len-77			
fallen	9	57	8
lenient	1	2	0

Trigrams - Rank List

	Initial	Medial	Final
ern-76			
latern	1	37	20
alternate	0	18	0
ges-76			
changes	3	13	55
biggest	0	5	0
gre-76			
grease	25	27	0
grenade	2	20	0
grew	1	0	0
grey	1	0	0
son-76			
son(3)	1	14	19
sons			
son's			
reason	0	17	10
ultrasonic	3	6	0
song	2	0	0
sonar	1	0	0
tar-76			
military	1	42	0
motar(1)	0	4	3
tar(1)	0	4	3
dic-75			
periodic	9	32	5
handicap	0	20	0
dice	1	2	0
prejudice	0	6	0
ler-75			
smaller	0	30	45
nit-75			
unit	0	53	2
unite	0	4	0
initial	0	15	0
zenith	0	1	0
ree-75			
three	0	58	17

Trigrams - Rank List

	Initial	Medial	Final
sts-75			
costs	0	1	74
als-74			
scandals	0	0	70
false	1	3	0
ger-74			
larger	7	13	18
longer	0	10	22
singer	0	1	2
algerian	0	1	0
ave-73			
gave	0	15	18
have	8	18	1
weave	0	9	3
loaves	0	0	1
ead-73			
head	0	30	24
plead	0	14	4
breadth	0	1	0
rad 73			
grade	16	21	0
gradually	5	17	0
cradle	0	140	0
cur-72			
occur	27	17	5
secure	7	16	0
nds 72			
hands	0	10	62
rai-72			
rain	19	52	0
prairie	0	1	0

Trigrams – Rank List

	Initial	Medial	Final
ron 72			
iron	0	27	8
electron	0	17	3
throne	0	4	0
strong	0	8	0
pronoun	0	3	0
coroner	0	2	0
tru-72			
truck	14	44	0
true	8	6	0
ual-72			
usual	0	28	32
equal	0	9	2
squall	0	1	0
acc 71			
accacia	67	3	0
staccato	0	1	0
ale-71			
scale	1	23	24
morale	0	10	5
ambivalent	3	4	0
totaled	0	1	0
ied-71			
tried	0	0	53
carried	0	0	18
ism-71			
communism	0	0	63
dismal	8	0	0
ord 70			
orders	12	32	17
word	0	2	7
cordial	0	1	0
ged 69			
engaged	0	0	50
rugged	0	0	16
tagged	0	0	3

Trigrams - Rank List

	Initial	Medial	Final
can 67			
American	32	23	12
duc 64			
educate	7	0	0
produce	0	25	0
ducked	5	27	0
ick 64			
quick	0	40	24
tch 45			
watch	0	40	45

Tetragrams - Alphabetic List

	Initial	Medial	Final
able-147			
capable	0	0	132
able (1)	0	6	7
tablet	0	0	1
ably-27			
probably	0	0	27
ages-35			
ages (1)	0	0	5
languages	0	0	28
almagest	0	1	0
aine-26			
maine	0	25	1
ains-26			
remains	0	0	19
maintains	0	2	5
alis-39			
nationalism	0	16	0
nationalist	0	21	0
calisthenics	0	1	0
salisbury	0	1	0
aliz-34			
realize	0	27	0
realization	0	7	0
allo-32			
shallow	6	6	0
gallon	0	4	0
allow	10	0	0
ballon	0	2	0
swallow	0	3	0
ally-130			
really	0	0	125
Sally	0	1	4

Tetragrams - Alphabetic List

	Initial	Medial	Final
ance-117			
chance	0	6	23
distance	0	11	71
Renaissance	0	0	1
nuances	4	0	1
ands-30			
hands	0	8	18
thousands	0	0	4
ange-44			
change	8	28	0
evangelism	0	5	0
anger	1	2	0
ants-37			
ants (1)	0	0	5
wants	0	0	2
giants	0	0	29
arch-27			
monarch	8	2	1
research	0	4	3
arch (2)	1	3	3
arches			
atch-32			
watch	1	5	0
match	0	12	14
ated-163			
related	0	0	152
treated	0	1	7
floated	0	0	3
ates-52			
rates	0	0	47
pirates	0	0	3
greatest	0	2	0
atic-37			
static	0	10	27

Tetragrams - Alphabetic List

	Initial	Medial	Final
ator-60			
senator	0	18	4
operator	0	1	37
atur-37			
nature	0	5	0
natural	0	11	0
Saturday	0	2	0
temperature	0	13	0
creature	0	6	0
bili-42			
ability	0	42	0
bles-28			
tables	0	4	18
bless	5	0	0
noblest	0	1	0
call-60			
call (2) calls	3	3	1
specifically	0	0	50
callous	1	0	0
cate-30			
delicate	0	0	2
locate	2	13	10
category	3	0	0
cent-58			
cent (2) cents	15	21	20
cept-33			
except	0	24	7
sceptical	0	2	0
cess-41			
process	0	30	7
necessary	0	4	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
chan-39			
chance	10	4	0
change	5	6	0
mechanical	0	8	0
chandelier	1	0	0
archangel	1	1	0
merchant	0	3	0
char-38			
character	9	0	0
orchards	0	2	0
charged	16	5	0
charitable	3	0	0
chariot	1	0	0
charlotte	2	0	0
ched-41			
matched	0	0	36
ached	0	0	1
mustached	0	0	1
schedules	0	3	0
ches-47			
watches	0	0	33
orchestra	0	4	1
chest	5	3	0
chiches	0	0	1
cial-38			
special	0	21	17
cing-36			
dancing	0	0	36
cked-30			
backed	0	0	29
wicked	0	0	1
coll-30			
college	5	0	0
collect	21	4	0
comm-81			
command	51	8	0
comment	19	3	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
cond-29			
second	18	4	3
condemnation	2	2	0
conf-49			
confront	39	0	0
confrontation	10	0	0
conv-38			
convey	33	3	0
convoy	2	0	0
coun-44			
count	25	14	0
country	5	0	0
cour-32			
courage	3	9	0
scoured	0	3	0
course	14	3	0
crea-32			
creaked	6	13	0
create	10	3	0
ctur-27			
picture	0	27	0
cula-31			
circular	0	13	0
circulating	0	18	0
dent-57			
president	5	21	25
student	0	0	6
ders-44			
leaders	0	0	29
undersea	0	13	0
leadership	0	2	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
dict-28			
predict	7	5	5
dictionary	2	8	0
indictment	2	8	0
ding-141			
building	0	0	141
disp-31			
display	0	4	27
dist-49			
methodist	0	1	4
distant	40	4	0
duct-28			
ducts (1)	0	10	7
deduction	0	10	0
ease-29			
ease (1)	2	3	4
increase	0	6	13
econ-28			
second	6	11	0
reconsider	3	8	0
eigh-28			
weigh	5	17	3
height	0	3	0
ence-110			
evidence	0	10	100
ened-37			
opened	0	0	36
benediction	0	1	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
ener-33			
opener	0	24	5
general	0	3	0
scenery	0	1	0
enin(g)-29			
(g always follows except in peninsula)			
evening	0	27	0
screning	0	1	0
ense-30			
sense	0	9	19
ensemble	2	0	0
entr-26			
central	0	26	0
ents-107			
contents	0	0	107
eral-34			
general	0	11	16
overall	0	6	0
herald	0	1	0
erat-79			
operate	0	34	0
desperate	0	11	0
operation	0	30	0
temperature	0	4	0
ered-97			
scattered	0	0	88
peered	0	0	8
heredity	0	1	0
eren-37			
difference	0	28	0
adherence	0	5	0
serene	0	3	0
weren't	0	1	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
erse-29			
verse	0	9	11
overseas	0	2	0
superseded	0	1	0
herself	0	1	0
interest	0	5	0
erve-26			
serve	0	10	14
intervention	0	2	0
esse-60			
dressed	1	35	21
essential	2	0	0
dessert	0	1	0
este-33			
tested	0	32	0
homesteader	0	1	0
ever-52			
ever (1)	11	13	15
fever	0	8	1
severe	0	3	0
expl-30			
explain	27	3	0
fect-30			
perfect	0	0	2
defect	2	12	6
affection	0	8	0
ffer-27			
differ	0	20	7
ffic-27			
official	0	15	0
office	0	6	0
traffic	0	4	1
suffice	0	1	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
fici-27			
official	0	25	0
deficit	0	2	0
fied-32			
identified	0	0	32
fore-29			
fore (1)	22	0	4
forest	2	0	0
form-63			
form (2)	20	27	14
forms			
fort-29			
fort (1)	6	5	6
forth	4	0	0
fortunate	4	3	0
full-30			
full (1)	4	25	0
gran-26			
grand	19	0	0
gran (1)			
migrant	0	6	0
gree-29			
green	14	7	8
hand-26			
hand (2)	19	0	2
hands			
merchandise	0	3	0
hing-78			
rushing	0	4	73
hinges	1	0	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
iate-29			
immediate	0	2	9
appreciate	0	14	4
ible-42			
possible	0	0	40
Bible	0	0	1
foibles	0	0	1
ical-140			
musical	0	49	89
criticality	0	2	0
icat-68			
indicate	0	63	0
delicate	0	5	0
iden-43			
widen	9	1	1
evident	0	32	0
ifie-38			
identified	0	38	0
ight-112			
height	0	50	45
eight	0	10	7
imen-29			
specimen	2	27	0
ings-71			
sings	0	1	70
inst-37			
instance			
institution	36	0	1

Tetragrams - Alphabetic List

	Initial	Medial	Final
ishe-38			
wished	0	0	24
fisher	0	5	0
wishes	0	9	0
ists-38			
artists	0	0	38
itat-37			
habitat	0	0	1
hesitate	0	13	4
imitation	0	19	0
excitatory	0	1	0
itch-28			
itch (1)	1	16	10
ited-29			
visited	0	0	18
united	0	1	5
waited	0	2	0
suited	0	2	0
exploited	0	1	
itte-32			
fitted	0	32	0
iver-38			
river	0	13	7
receiver	0	2	0
driver	0	9	4
universities	0	3	0
ives-35			
gives	0	0	22
wines	0	1	11
divestiture	0	1	0
izat-31			
(always in ization)			
organization	0	31	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
ized-56			
apoligized	0	0	55
seized	0	1	0
ject-33			
object	0	14	11
objection	0	7	0
conjecture	0	1	0
king-74			
king (2) kings	2	2	68
land-44			
land (1)	8	1	34
late-64			
late (1)	4	28	26
chocolate	0	1	4
lect-63			
lecture	4	12	0
select	0	36	11
less-67			
less (1)	6	13	47
ligh-33 (always followed by t)			
light (2) lights	8	7	16
line-43			
line (2) lines	2	8	15
gasoline	0	4	3
linear	0	2	0
discipline	1	4	2
ling-145			
cling	7	7	131

Tetragrams - Alphabetic List

	Initial	Medial	Final
lish-29			
foolish	0	20	9
list-44			
list (1)	2	10	22
listening	7	2	0
lize-38			
fertilize	0	25	13
lled-35	0	0	35
llow-29			
follow	0	9	13
allow	0	5	2
mark-26			
mark (2)	13	4	7
marks			
mate-33			
mate (2)	1	5	8
mates			
climate	0	3	6
materialize	5	0	0
maternal	1	0	0
amateur	0	2	0
mber-32			
number	0	10	19
bomber	0	0	3
mble-29			
grumble	0	11	16
emblematic	0	1	0
gamblers	0	1	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
ment-251			
moment	1	0	225
mentality	1	20	0
mention	4	0	0
mine-26			
determine	0	16	4
mine	3	3	0
ming-55			
charming	1	4	50
mini-33			
minimum	11	19	0
mining	1	0	0
dominion	0	1	0
termini	0	0	1
miss-34			
miss (2) misses	6	6	1
omission	0	17	0
Missouri	0	2	0
nate-51			
senate	0	18	11
donated	0	17	15
nced-28			
announced	0	0	25
conceded	0	3	0
nded-38			
ended	0	0	38
nera-28			
funeral	0	14	0
generates	0	12	0
ners-29			
owners	0	1	25
ownership	0	3	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
ness-102			
meaness	0	4	98
ning-129			
learning	0	2	126
condemning	0	0	1
nish-29			
finish	0	11	18
nist-35			
pianist	0	17	18
ogra-40			
Krystall ogra	0	0	1
program	0	22	0
photographer	0	16	0
ompa-30			
compact	0	0	30
onal-83			
personal	0	28	51
personality	0	3	0
octagonal	0	0	1
oned-26			
mentioned	0	0	22
phoned	0	0	4
onst-41			
constant	0	41	0
oper-30			
proper	14	3	3
cooper	8	0	2
orat-34			
decorated	0	10	0
oration	1	19	0
oratory	2	11	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
orth-30			
north	9	11	3
worth	0	6	1
osit-34			
deposit	0	8	2
position	0	18	0
curiosity	0	5	0
opposite	0	1	0
ough-38			
through	0	1	2
enough	0	6	4
though	0	1	7
cough	0	0	2
boughs	0	0	2
sought	0	3	10
ound-56			
found	0	29	24
wound	0	1	2
ount-52			
count	0	33	14
country	0	5	0
ousl(y)-37			
(always followed by y)			
nervously	0	0	37
over-98			
over (1)	48	3	8
cover	0	23	7
proverb	0	7	0
movers	0	1	0
ower-29			
slower	0	3	5
power	0	7	11
narrower	0	1	2

Tetragrams - Alphabetic List

	Initial	Medial	Final
para-40			
comparable	20	8	0
parade	2	6	0
separates	0	4	0
part-47			
part (2) parts	23	10	5
partial	1	2	0
departure	0	2	0
parthenon	1	1	0
pect-46			
expect	0	33	13
pend-27			
spend	1	21	5
ping-67			
helping	0	0	65
impinge	0	2	0
plan-30			
plan (2) plans	14	3	0
plane	5	2	0
explanation	0	4	0
port-74			
port (2) ports	14	27	19
rapport	0	0	1
portion	2	7	0
Portugal	2	0	0
pose-27			
pose (2) poses	0	14	10
purposely	0	3	0
posi-37			
opposing	3	22	0
deposit	0	6	5
opposite	0	1	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
pped-37			
stopped	0	0	3
pres-78			
presence	12	0	0
prescribe	18	8	0
press	5	21	0
repression	2	12	0
prin-27			
print	14	4	0
spring	0	9	0
prof-26			
profess	19	0	0
prof (1)	6	0	0
prop-43			
prop (2)	12	0	0
props			
propel	17	7	0
prophet	5	0	0
prov-40			
prove	5	13	0
proverb	15	2	0
providence	5	0	0
rabl-34			
favorable	0	34	0
ract-63			
contract	0	43	11
character	0	9	0
radi-38			
radial	15	15	0
radical	5	9	0
contradict	0	3	0
paradigm	0	1	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
rage-30			
average	0	7	12
rage (1)	0	4	2
garage	0	0	4
rain-31			
rain rains (2)	5	11	31
rans-50			
veternas	0	0	1
transom	2	47	0
rant-26			
warrant	0	5	13
grant	0	4	2
resturant	0	0	2
raph-42			
(always with a g proceeding)			
graph	0	34	8
rate-91			
rate (1)	1	30	34
accurate	0	6	14
strategy	0	2	0
strategic	0	1	0
fraternity	0	2	0
read-28			
bread	3	8	10
read reads (2)	5	0	0
reco-39			
recognize	15	1	0
reconsider	22	1	0
rect-31			
direct	5	20	6

Tetragrams - Alphabetic List

	Initial	Medial	Final
rent-40			
rent (2) rents	3	9	21
differential	0	5	0
resi-29			
resided	4	1	0
residence	8	6	0
resist	7	1	0
foresight	0	1	0
electrophoresis	0	1	0
ress-81			
press	0	40	24
impression	0	17	0
rest-53			
interest	0	4	4
rest (2) rests	4	6	12
restatement	20	2	0
rial-28			
material	0	4	22
trial	0	0	2
rica-28			
America	0	24	3
intricate	0	1	0
ring-160			
ring (2) rings	0	2	152
fringes	0	4	0
rity-27			
authority	0	0	27
rous-30			
vigorous	0	4	19
arousal	0	7	0
ruct-26			
construct	4	18	4

Tetragrams - Alphabetic List

	Initial	Medial	Final
scen-26			
descent	2	20	0
scene	4	0	0
scri-33			
scribe	0	13	0
(all scrib)			
script	0	20	0
sent-36			
sent (1)	7	6	4
resent	0	13	5
serv-47			
observe	0	28	0
serve	10	7	0
reservoir	0	2	0
shed-49			
shed (2)	0	0	3
sheds			
pushed	0	0	44
ship-43			
ship			
ships (3)	5	1	34
ship's			
sing-92			
using	0	1	40
sing			
sings (2)	6	3	40
sion-145			
decision	0	6	58
mansion	0	17	64
sist-37			
resist	0	7	1
insist	0	22	7
sive-56			
impressive	0	14	42

Tetragrams - Alphabetic List

	Initial	Medial	Final
spec-69			
respect	15	15	12
special	21	4	0
species	1	1	0
spon-31			
respond	8	22	0
sponge	1	0	0
ssed-38			
passed	0	0	38
stal-30			
crystal	0	0	6
stall	3	13	4
stallion	2	2	0
stan-55			
Pakistan	9	19	2
distance	0	25	0
stat-45			
state	12	9	0
station	4	4	0
statue	12	2	1
sted-44			
listed	0	0	44
sten-32			
listen	0	9	4
existence	0	18	1
ster-92			
sister	3	30	47
austere	0	3	0
stereo	4	5	0
stic-64			
plastic	4	12	41
justice	0	7	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
stor-40			
pastor	0	1	7
stored	0	32	0
stra-86			
orchestra	1	2	1
abstract	9	10	0
strain	19	40	0
straw	2	2	0
stre-35			
streak	11	3	0
strength	15	5	0
strewn	1	0	0
stri-54			
Austria	8	19	0
distribute	0	11	0
stride	15	1	0
stro-29			
stroke	8	6	1
strong	5	0	0
disastrous	0	2	0
destroying	0	4	0
astronomy	0	3	0
stru-43			
construct	11	31	0
construed	0	1	0
subs-29			
substitute	29	0	0
supp-27			
supper	27	0	0
sure-30			
pleasure	0	5	12
sure (1)	1	4	7

Tetragrams - Alphabetic List

	Initial	Medial	Final
tabl-49			
table (2)	3	0	4
suitable	0	7	28
tablet	1	6	0
tain-58			
certain	0	7	12
maintain	0	25	14
tall-34			
tall (1)	1	12	4
totally	0	10	0
tally	2	4	0
tant-37			
assistant	0	6	24
tantalizing	0	4	0
substantial	0	2	0
debutante	0	1	0
tate-35			
state	0	8	26
staten	0	1	0
tche-41			
watched	0	25	16
tely-31			
lately	0	0	31
temp-26			
temper	14	12	0
tend-33			
tend (2)	8	13	9
tends			
christendor	0	1	0
tent-45			
tent (2)	2	7	18
tents	0	15	0
potential	1	0	0
tenth			

Tetragrams - Alphabetic List

	Initial	Medial	Final
tere-41			
austere	0	0	1
scattered	0	37	0
stereo	0	3	0
teri-54			
cafeteria (tear-i)	0	28	0
sterilization (tare-o)	0	4	0
entering (tur)	0	22	0
tern-30			
western	0	20	10
terr-27			
terror	15	1	0
terrific	1	10	0
ters-74			
sisters	0	8	63
watershed	0	3	0
test-31			
test (2)	7	7	3
tests			
latest	0	4	9
tial-28			
essential	0	5	19
celestial	0	3	1
ties-75			
parties	0	0	73
(ties 1)			
prettiest	0	0	1
ting-299			
lasting	0	7	288
mightingale	0	1	0
contingency	0	3	0
tion-821			
action	0	105	707
question	0	6	3

Tetragrams - Alphabetic List

	Initial	Medial	Final
tive-127			
active	0	5	112
tori-31			
factories	0	7	0
editorial	0	24	0
tors-48			
motors	2	2	43
electors	0	0	1
tory-30			
history	0	0	7
tory (1)	0	1	21
trac-52			
trace	4	1	0
track	8	34	0
contraception	0	4	0
tetrachloride	0	1	0
tran-64			
trance	50	5	0
strange	0	8	0
registrant	0	1	0
trat-49			
demonstrate	0	29	0
demonstration	0	14	0
strategy	0	3	0
strategic	0	3	0
trib-26			
contribute	2	19	0
tribe	5	0	0
tric-30			
tricks	2	19	7
electricity	0	2	0
truc-30			
struck	2	27	0
truce	1	0	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
tter-60			
better	0	31	29
ture-88			
picture	0	18	66
nature	0	1	3
ucti-28			
deductible	0	10	0
deduction	0	18	0
ular-34			
popular	0	5	25
popularity	0	4	0
ully-28			
fully	0	26	0
gully	0	2	0
ured-29			
measured	0	1	18
poured	0	0	1
endured	0	0	8
scoured	0	0	1
ures-33			
figures	0	0	30
cures	0	0	1
purest	0	1	0
picturesque	0	1	0
usly-37			
(always in ously)			
previously	0	0	37
vely-28			
lovely	0	28	0

Tetragrams - Alphabetic List

	Initial	Medial	Final
vent-44			
vent (2) vents	2	16	9
seventh	0	2	0
convention	2	11	0
vers-64			
covers	0	0	12
verse	4	42	0
version	1	5	0
vert-30			
overt	2	8	4
overthrow	0	3	0
overtake	1	10	0
overtures	0	2	0
ving-47			
having	0	0	47
visi-28			
visibility	9	0	2
vision (2) visions	0	12	0
advising	0	3	0
ward-38			
ward (2) wards	2	4	4
upward	0	[illegible]	21
wing-36			
wing (2) wings	0	3	30
twinge	0	1	0
ying-59			
trying	0	0	59
zing-29			
zing (1)	0	1	27

Tetragrams - Rank List

	Initial	Medial	Final
tion-821			
action	0	105	707
question	0	6	3
ting-299			
lasting	0	7	288
nightingale	0	1	0
contingency	0	3	0
ment-251			
moment	1	0	225
mentality	1	20	0
mention	4	0	0
ated-163			
related	0	0	152
treated	0	1	7
floated	0	0	3
ring-160			
rings(2)	0	2	152
fringe	0	4	0
able-147			
capable	0	0	132
able(1)	0	6	7
tablet	0	0	1
ling-145			
cling	7	7	131
sion-145			
decision	0	6	58
mansion	0	17	64
ding-141			
building	0	0	141
ical-140			
musical	0	49	89
criticality	0	2	0

Tetragrams - Rank List

	Initial	Medial	Final
ally-130			
really	0	0	125
Sally	0	1	4
ning-129			
learning	0	2	126
condemning	0	0	1
tive-127			
active	0	15	112
ance-117			
chance	0	6	23
distance	0	11	71
Renaissance	0	0	1
nuances	4	0	1
ight-112			
height	0	50	45
eight	0	10	7
ence-110			
evidence	0	10	100
ents-107			
contents	0	0	107
ness-102			
meaness	0	4	98
over-98			
over	48	3	8
cover	0	23	7
proverb	0	7	0
movers	0	1	0
ered-97			
scattered	0	0	88
peered	0	0	8
heredity	0	1	0
sing-92			
using	0	1	40
sings(2)	6	3	40

Tetragrams - Rank List

	Initial	Medial	Final
ster-92			
sister	3	30	47
austere	0	3	0
stereo	4	5	0
rate-91			
rate(1)	1	30	34
accurate	0	6	14
strategy	0	2	0
strategic	0	1	0
fraternity	0	2	0
ture-88			
picture	0	18	66
nature	0	1	3
stra-86			
orchestra	1	2	1
abstract	9	10	0
strain	19	40	0
straw	2	2	0
onal-83			
personal	0	28	51
personality	0	3	0
octagonal	0	0	1
comm-81			
command	51	8	0
comment	19	3	0
ress-81			
press	0	40	24
impression	0	17	0
erat-79			
operate	0	34	0
desperate	0	11	0
operation	0	30	0
temperature	0	4	0
king-78			
rushing	0	4	73
hinges	1	0	0

Tetragrams - Rank List

	Initial	Medial	Final
late-64			
late(1)	4	28	26
chocol te	0	1	4
vers-64			
covers	0	0	12
verse	4	42	0
version	1	5	0
stic-64			
plastic	4	12	41
justice	0	7	0
tran-64			
trance	50	5	0
strange	0	8	0
registrant	0	1	0
form-63			
form	20	27	14
forms(2)			
lect-63			
lecture	4	12	0
select	0	36	11
ract-63			
contract	0	43	11
character	0	9	0
ator-60			
senator	0	18	4
operator	0	1	37
call-60			
call	3	3	1
calls(2)			
specifically	0	0	50
callous	1	0	0
esse-60			
dressed	1	35	21
essential	2	0	0
dessert	0	1	0

Tetragrams - Rank List

	Initial	Medial	Final
pres-78			
presence	12	0	0
prescribe	18	8	0
press	5	21	0
repression	2	12	0
ties-75			
parties	0	0	73
ties(1)			
prettiest	0	0	1
king-74			
king	2	2	68
kings(2)			
port-74			
port(2)	14	27	19
ports			
rapport	0	0	1
portion	2	7	0
portugal	2	0	0
ters-74			
sisters	0	8	63
watershed	0	3	0
ings-71			
sings	1	0	70
spec-69			
respect	15	15	12
special	21	4	0
species	1	1	0
icat-68			
indicate	0	63	0
delicate	0	5	0
less-67			
restless	6	13	48
ping-67			
helping	0	0	65
impinge	0	2	0

Tetragrams - Rank List

	Intial	Medial	Final
tter-60			
better	0	31	29
ying-59			
trying	0	0	59
cent-58			
cent(s)	15	21	20
cents			
tain-58			
certain	0	7	12
maintain	0	25	14
dent-57			
president	5	21	25
student	0	0	6
ized-56			
apologized	0	0	55
seized	0	1	0
ound-56			
found	0	29	24
wound	0	1	2
sine-56			
impressive	0	14	42
ming-55			
charming	1	4	50
stan-55			
pakistan	9	19	2
distance	0	25	0
stri-54			
austria	8	19	0
distribute	0	11	0
stride	15	1	0

Tetragrams - Rank List

	Initial	Medial	Final
teri-54			
cafeteria (tear-i)	0	28	0
sterilization(tare-a)	0	4	0
entering(tur)	0	22	0
rest-53			
interest	0	4	4
rest(2)	4	6	12
rests			
restatement	20	2	0
ates-52			
rates	0	0	47
pirates	0	0	3
greatest	0	2	0
ever-52			
ever(1)	11	13	15
fever	0	8	1
severe	0	3	0
ount-52			
count	0	33	14
country	0	5	0
trac-52			
trace	4	1	0
track	8	34	0
contraception	0	4	0
tetrachloride	0	1	0
nate-51			
senate	0	8	11
donated	0	17	15
rans-50			
veteran	0	0	1
transom	2	47	0
conf-49			
confront	39	0	0
confrontation	10	0	0

Tetragrams - Rank List

	Initial	Medial	Final
dist-49			
methodist	0	1	4
distant	40	4	0
shed-49			
shed(2)	0	0	3
pushed	0	0	44
tabl-49			
table(2)	3	0	4
suitable	0	7	28
tablet	1	6	0
trat-49			
demonstrate	0	29	0
demonstration	0	14	0
strategy	0	3	0
strategic	0	3	0
tors-48			
motors	2	2	43
electors	0	0	1
ches-47			
watches	0	0	33
orchestra	0	4	1
chest	5	3	0
cliches	0	0	1
part-47			
part(2)			
parts	23	10	5
partial	1	2	0
departure	0	2	0
parthenon	1	1	0
serv-47			
observe	0	28	0
serve	10	7	0
reservoir			
ving-47			
having	0	0	47

Tetragrams - Rank List

	Initial	Medial	Final
pect-46			
expect	0	33	12
stat-45			
state	12	9	0
station	4	4	0
statue	12	2	1
stat-1			
tent-45			
tent	2	7	18
tents(2)			
potential	0	15	0
tenth	1	0	0
ange-44			
change	8	28	0
evangelism	0	5	0
anger	1	2	0
coun-44			
count	25	14	0
country	5	0	0
ders-44			
leaders	0	0	29
undersea	0	13	0
leadership	0	2	0
land-44			
land(1)	8	1	34
list-44			
list(1)	2	10	22
listening	7	2	0
sted-44			
listed	0	0	44
vent-44			
vent(2)	2	16	9
vents			
seventh	0	2	0
convention	2	11	0

Tetragrams - Rank List

	Initial	Medial	Final
iden-43			
widen	9	1	1
evident	0	32	0
line-33			
line(2) lines	2	8	15
gasoline	0	4	3
linear	0	2	0
discipline	1	4	2
prop-43			
prop(s)(2) proper	12	0	0
propel	17	7	0
prophet	5	0	0
ship-43			
ship ships(3) ships	5	1	34
stru-43			
construct	11	31	0
construded	0	1	0
bili-42			
ability	0	42	0
ible-42			
possible	0	0	40
Bible	0	0	1
foibles	0	0	1
raph-42			
(always with a g proceeding)			
graph	0	34	8
cess-41			
process	0	30	7
necessary	0	4	0
ched-41			
matched	0	0	36
ached	0	0	1
mustached	0	0	
schedules	0	3	

Tetragrams - Rank List

	Initial	Medial	Final
onst-41			
constant	0	41	0
tche-41			
watched	0	25	16
tere-41			
austere	0	0	1
scattered	0	37	0
stereo	0	3	0
ogra-40			
krystall ogra	0	0	1
program	0	22	0
photographer	0	16	0
para-40			
comparable	20	8	0
parade	2	6	0
separates	0	4	0
prov-40			
prove	5	13	0
proverb	15	2	0
providence	5	0	0
rent-40			
rents (2)	3	9	21
differential	0	5	0
stor-40			
pastor	0	1	7
stored	0	32	0
alis-39			
nationalism	0	16	0
nationalist	0	21	0
calisthenics	0	1	0
salisbury	0	1	0

Tetragrams - Rank List

	Initial	Medial	Final
chan-39			
chance	10	5	0
change	5	6	0
mechanical	0	8	0
chandelier	1	0	0
archangel	0	1	0
merchant	0	3	0
reco-39			
recognize	15	1	0
reconsider	22	1	0
char-38			
character	9	0	0
orchards	0	2	0
charged	16	5	0
charitable	3	0	0
chariot	1	0	0
charlotte	2	0	0
cial-38			
special	0	21	17
conv-38			
convey	33	3	0
convoy	2	0	0
ifie-38			
identified	0	38	0
ishe-38			
wished	0	0	24
fisher	0	5	0
wishes	0	9	0
ists-38			
artists	0	0	38
iver-38			
river	0	13	7
receiver	0	2	0
driver	0	9	4
universities	0	3	0

Tetragrams - Rank List

	Initial	Medial	Final
lize-38			
fertilize	0	25	13
nded-38			
ended	0	0	38
ough-38			
through	0	1	2
enough	0	6	4
though	0	1	7
cough	0	0	2
boughs	0	0	2
sought	0	3	10
radi-38			
radial	15	15	0
radical	5	9	0
contradict	0	3	0
paradigm	0	1	0
ssed-38			
passed	0	0	38
ward-38			
ward	2	4	4
wards(2)			
upward	0	5	21
ants-37			
ants(1)	0	0	5
wants	0	0	2
giants	0	0	29
atic-37			
static	0	10	27
atur-37			
nature	0	5	0
natural	0	11	0
Saturday	0	2	0
temperature	0	13	0
creature	0	6	0

Tetragrams - Rank List

	Initial	Medial	Final
usly-37			
(always in ously)			
previously	0	0	37
cing-36			
dancing	0	0	36
sent-36			
sent(1)	7	6	4
resent	0	13	5
wing-36			
wing	2	3	30
wings			
twinge	0	1	0
ages-35			
ages(1)	0	0	5
languages	0	0	28
almagest	0	1	0
ives-35			
gives	0	0	22
wives	0	1	11
divestiture	0	1	0
lled-35			
called	0	0	35
nist-35			
pianist	0	17	18
stre-35			
streak	11	3	0
strength	15	5	0
strewn	1	0	0
tate-35			
state	0	8	26
staten	0	1	0
aliz-34			
realize	0	27	0
realization	0	7	0

Tetragrams - Rank List

	Initial	Medial	Final
ened-37			
opened	0	0	36
benediction	0	1	0
eren-37			
difference	0	28	0
adherence	0	5	0
serene	0	3	0
weren't	0	1	0
inst-37			
instance	36	0	1
institution			
itat-37			
habitat	0	0	1
hesitate	0	12	4
imitation	0	19	0
excitatory	0	1	0
ousl(y)-37			
nervously	0	0	37
posi-37			
opposing	3	22	0
deposit		6	5
opposite	0	1	0
pped-37			
stopped	0	0	37
sist-37			
resist	0	7	1
insist	0	22	7
tant-37			
assistant	0	6	24
tantalizing	0	4	0
substantial	0	2	0
debutante	0	1	0

Tetragrams - Rank List

	Initial	Medial	Final
eral-34			
general	0	11	16
overall	0	6	0
herald	0	1	0
miss-34			
miss(2)	6	6	1
misses			
ommission	0	17	0
missouri	0	2	0
orat-34			
decorated	0	10	0
oration	1	10	0
oratory	2	11	0
osit-34			
deposit	0	8	2
position	0	18	0
curiosity	0	5	0
opposite	0	1	0
rabl-34			
favorable	0	34	0
tall-34			
tall(1)	1	12	4
totally	0	10	0
tally	2	4	0
ular-34			
popular	0	5	25
popularity	0	4	0
cept-33			
except	0	24	7
sceptical	0	2	0
ener-33			
opener	0	24	5
general	0	3	0
scenery	0	1	0

Tetragrams - Rank List

	Initial	Medial	Final
este-33			
tested	0	32	0
homesteader	0	1	0
ject-33			
object	0	14	11
objection	0	14	11
conjecture	0	1	0
ligh-33			
(always followed by t)			
light			
lights(2)	8	7	16
mate-33			
mate			
mates(2)	1	5	8
climate	0	3	6
materialize	5	0	0
maternal	1	0	0
amateur	0	2	0
mini-33			
minimum	11	19	0
mining	1	0	0
dominion	0	1	0
termini	0	0	1
scri-33			
scribe	0	13	0
all scrib			
script	0	20	0
tend-33			
tend	8	13	9
tends(2)			
christendor	0	1	0
ures-33			
figures	0	0	30
cures	0	0	1
purest	0	1	0
picturesque	0	1	0

Tetragrams - Rank List

	Initial	Medial	Final
allo-32			
shallow	6	6	0
gallon	0	4	0
allow	10	0	0
ballon	0	2	0
swallow	0	3	0
atch-32			
watch	1	5	0
match	0	12	14
cred-32			
creaked	6	13	0
create	10	3	0
cour-32			
scoured	0	3	0
courage	3	9	0
course	14	3	0
fied-32			
identified	0	0	32
itte-32			
fitted	0	32	0
mber-32			
number	0	10	19
bomber	0	0	3
cula-31			
circular	0	13	0
circulariting	0	18	0
disp-31			
display	0	4	27
izat-31			
(always in ization)			
organization	0	31	0

Tetragrams - Rank List

	Initial	Medial	Final
rain-31			
rain	5	11	13
rains(2)			
rect-31			
direct	5	20	6
spon-31			
respond	8	22	0
sponge	1	0	0
tely-31			
lately	0	0	31
test-31			
test	7	6	3
tests(2)			
latest	0	4	9
tori-31			
factories	0	7	0
editorial	0	24	0
ands-30			
hands	0	8	18
thousands	0	0	4
cate-30			
delicate	0	0	2
locate	2	13	10
category	3	0	0
cked-30			
backed	0	0	29
wicked	0	0	1
coll-30			
college	5	0	0
collect	21	4	0

Tetragrams - Rank List

	Initial	Medial	Final
ense-30			
sense	0	9	19
ensemble	2	0	0
expl-30			
explain	27	3	0
fect-30			
perfect	0	0	2
defect	2	12	6
affection	0	8	0
full-30			
full(1)	4	25	0
ompa-30			
compact	0	0	30
oper-30			
proper	14	3	3
cooper	8	0	2
orth-30			
north	9	11	3
worth	0	6	1
plan-30			
plan			
plans(20	14	3	0
plane	5	2	0
explanation	0	4	0
rage-30			
average	0	7	12
rage(1)	0	4	2
garage	0	0	4
rous-30			
vigorous	0	4	19
arousal	0	7	0

Tetragrams - Rank List

	Initial	Medial	Final
stal-30			
crystal	0	0	6
stall	3	13	4
stallion	2	2	0
sten-32			
listen	0	9	4
existence	0	18	1
sure-30			
pleasure	0	5	12
tern-30			
western	0	20	10
tory-30			
history	0	0	7
tory(1)	0	1	21
tric-30			
tricks	3	19	7
electricity	0	2	0
truc-30			
struck	2	27	0
truce	1	0	0
vert-30			
overt	2	8	4
overthrow	0	3	0
overtake	1	10	0
overtures	0	2	0
cond-29			
second	18	4	3
condemnation	2	2	0
ease-29			
ease(1)	2	3	4
increase	0	6	13

Tetragrams - Rank List

	Initial	Medial	Final
enin(g)-29			
(g always follows except in peninsula)			
evening	0	27	0
screening	0	1	0
erse-29			
verse	0	9	11
overseas	0	2	0
superseded	0	1	0
herself	0	1	0
interest	0	5	0
fore-29			
fore(1)	22	0	4
forest	2	0	0
fort-29			
fort(1)	6	5	6
forth	4	0	0
fortunate	4	3	0
gree-29			
green	14	7	8
iate-29			
immediate	0	2	9
appreciate	0	14	4
imen-29			
specimen	2	27	0
ited-29			
visited	0	0	18
united	0	1	5
waited	0	2	0
suited	0	2	0
exploited	0	1	0
lish-29			
foolish	0	20	9

Tetragrams - Rank List

	Initial	Medial	Final
llow-29			
follow	0	9	13
mble-29			
grumble	0	11	16
emblematic	0	1	0
gamblers	0	1	0
ners-29			
owners	0	1	25
ownership	0	3	0
nish-29			
finish	0	11	18
ower-29			
slower	0	3	5
power	0	7	11
narrower	0	1	2
pose-29			
pose			
poses(2)	0	14	10
purposely	0	3	0
resi-29			
resided	4	1	0
residence	8	6	0
resist	7	1	0
foresight	0	1	0
electrophoresis	0	1	0
stro-29			
stroke	8	6	1
strong	5	0	0
disastrous	0	2	0
destroying	0	4	0
astronomy	0	3	0
subs-29			
substitute	29	0	0

Tetragrams - Rank List

	Initial	Medial	Final
ured-29			
measured	0	1	18
poured	0	0	1
endured	0	0	8
scoured	0	0	1
zing-29			
zing(1)	0	1	27
bles-28			
tables	0	4	18
bless	5	0	0
noblest	0	1	0
dict-28			
predict	7	5	5
dictionary	2	8	0
indictment	0	1	0
duct-28			
ducts(1)	0	10	7
deduction	0	10	0
econ-28			
second	6	11	0
reconsider	3	8	0
eigh-28			
weigh	5	17	3
height	0	3	0
itch-28			
itch(1)	1	16	10
nced-28			
announced	0	0	25
conceded	0	3	0
nera-28			
funeral	0	14	0
generates	0	12	0

Tetragrams - Rank List

	Initial	Medial	Final
read-28			
bread	3	8	10
read			
reads(2)	5	0	0
rial-28			
material	0	4	22
trial	0	0	2
rica-28			
America	0	24	3
intricate	0	1	0
tial-28			
essential	0	5	19
celestial	0	3	1
ucti-28			
deductible	0	10	0
deduction	0	18	0
ully-28			
fully	0	26	0
gully	0	2	0
vely-28			
lovely	0	28	0
visi-28			
visibility	9	0	2
vision			
visions(2)	0	12	0
advising	0	3	0
ably-27			
probably	0	0	27

Tetragrams - Rank List

	Initial	Medial	Final
arch-27			
monarch	8	2	1
research	0	4	3
arch(2)	1	3	3
arches			
ctur-27			
picture	0	27	0
ffer-27			
differ	0	20	7
ffic-27			
offical	0	15	0
office	0	6	0
traffic	0	4	1
suffice	0	1	0
fici-27			
official	0	25	0
deficit	0	2	0
pend-27			
spend	1	21	5
prim-27			
print	14	4	0
spring	0	9	0
rity-27			
authority	0	0	27
supp-27			
supper	27	0	0
terr-27			
terror	15	1	0
terrific	1	10	0
aine-26			
maine	0	25	1

Tetragrams - Rank List

	Initial	Medial	Final
ains-26			
remains	0	0	19
entr-26			
central	0	26	0
erul-26			
serue	0	10	14
intervention	0	2	0
gran-26			
grand	19	0	0
gran(1)			
migrant	0	6	0
hand-26			
hand			
hands(2)	19	0	2
merchandise	0	3	0
mark-25			
mark			
marks(2)	13	4	7
mine-26			
determine	0	16	4
mine	3	3	0
oned-26			
mentioned	0	0	22
phoned	0	0	4
prof-26			
profess	19	0	0
prof(1)	6	0	0
rant-26			
warrant	0	5	13
grant	0	4	2
restaurant	0	0	2

Tetragrams - Rank List

	Initial	Medial	Final
ruct-26			
construct	4	18	4
scen-26			
desent	2	20	0
scene	4	0	0
temp-26			
temper	14	12	0
trib-26			
contribute	2	19	0
tribe	5	0	0

Pentagrams - Alphabetic List

	Initial	Medial	Final
ained-22			
obtained	0	0	22
alist-22			
socialist	0	8	14
ality-30			
quality	0	0	6
relaity	0	0	24
alize-23			
generalize	0	15	8
ances-23			
chances	4	0	6
allowances	0	0	13
appro-21			
approach	9	1	0
approval	3	3	0
approximate	5	0	0
ately-22			
immediately	0	0	22
ating-76			
operating	0	1	62
coating	0	0	4
eating	0	0	8
sweating	0	0	1
ation-476			
situation	0	22	436
equation	0	2	0
national	0	16	0
ative-48			
declarative	0	4	31
administrative	0	2	11

Pentagrams - Alphabetic List

	Initial	Medial	Final
atter-24			
chatter	0	16	7
cattering	0	1	0
ature-22			
nature	0	0	11
temperature	0	1	11
creature	0	1	4
bilit-37			
possibility	0	37	0
cally-50			
specifically	0	0	50
ching-29			
watching	0	0	28
aching	0	0	1
commu-23			
communicate	18	1	0
communists	4	0	0
compa-30			
compact	2	2	0
companion	14	0	0
company	4	8	0
contr-35			
contract	34	1	0
const-30			
constant	26	4	0
count-35			
count	14	8	6
counts			
country	5	0	10

Pentagrams - Alphabetic List

	Initial	Medial	Final
elect-24			
elect (1)	15	6	2
ement-72			
statement			
element	0	0	1
ening-28			
listening	0	0	27
screening	0	0	1
ental-31			
dental	0	8	21
mentality	0	2	0
enter-23			
enter (1)	12	2	8
ently-33			
frequently	0	0	33
erate-30			
operate	0	11	8
desperate	0	3	7
aerated	0	1	0
ering-63			
considering	0	0	58
peering	0	0	5
espon-22			
respond	0	22	0
essed-26			
expressed	0	1	22
professedly	0	3	0
esses-21			
addresses	0	0	21

Pentagrams - Alphabetic List

	Initial	Medial	Final
fully-25			
fully (1)	0	0	24
gener-21			
general	21	0	0
gical-21			
logical	0	3	18
graph-41			
graph (1)	2	15	7
icall-48			
statistically	0	0	48
ident-30			
resident	0	13	8
identical	9	0	0
ified-29			
specified	0	0	29
ility-41			
utility	0	0	41
iment-23			
experiment	0	10	13
inate-28			
terminate	0	15	11
indeterminate	0	0	2
ingly-21			
willingly	0	0	21
inten-21			
intended	19	1	0
maintenance	0	1	0

Pentagrams - Alphabetic List

	Initial	Medial	Final
inter-83			
winter	71	6	0
painter	0	4	0
interior	2	0	0
ional-70			
national	0	22	47
rationale	0	1	0
ished-24			
published	0	0	24
ities-45			
facilities	0	0	45
ition-81			
position	19	0	62
ively-25			
respectively	0	0	24
lively	0	0	1
lated-27			
populated	0	0	27
light-33			
light (2) lights	7	8	16
lized-22			
realized	0	0	22
lling-38			
telling	0	3	35
logic-21			
logic (1)	2	17	1
matic-24			
automatic	0	7	17

Pentagrams - Alphabetic List

	Initial	Medial	Final
ments-58			
elements	0	0	50
meter-21			
kilometer	0	0	14
millimeters	3	0	3
cemetery	0	1	0
minat-36			
eliminate	0	33	0
indeterminate	0	3	0
minis-20			
reminiscent	5	9	0
diminish	0	6	0
missi-26			
admissible	2	1	0
missing	3	3	0
commission	2	15	0
ograp-32			
photograph	0	19	0
photography	0	13	0
organ-21			
organ (2) organs	11	4	0
organic	3	1	0
other-24			
another	4	2	12
bother	0	2	2
smother	0	0	1
psychotherapy	0	1	0
ously-37			
graciously	0	0	37

Pentagrams - Alphabetic List

	Initial	Medial	Final
parti-21			
participants	17	1	0
partial	2	1	0
posit-29			
deposit	5	3	2
opposite	0	1	0
position	1	17	0
press-40			
press (1)	6	29	3
cypress	0	0	1
rable-26			
considerable	0	0	26
rated-28			
rated (1)	0	0	27
ratio-89			
ratio (2)			
celebration	2	76	0
rational	9	0	0
rator-24			
operator	0	0	15
laboratory	0	7	2
rence-20			
difference	0	0	20
right-22			
right (2)	6	8	6
rights			
round-20			
round (1)	5	5	9
shing-30			
washing	1	2	27

Pentagrams - Alphabetic List

	Initial	Medial	Final
sions-38			
decisions	0	0	16
discussions	0	0	22
speci-27			
special	21	4	0
species	1	1	0
spect-36			
respect	10	15	11
ssion-63			
suppression	0	16	47
stand-21			
understand	8	8	5
state-20			
state (1)	10	3	5
sting-43			
sting (1)	0	8	34
strate-34			
demonstrate	0	0	28
strategy	5	1	0
struc-27			
construct	5	22	0
super-25			
super (1)	17	0	0
superfluous	4	0	0
superior	3	0	0
table-36			
table (2) tables	3	0	4
comfortable	0	0	26
tablet	1	0	0

Pentagrams - Alphabetic List

	Initial	Medial	Final
tered-30			
scattered	0	0	30
tical-43			
political	0	21	22
tions-194			
nations	0	2	192
tract-37			
contract	4	25	8
trate-24			
illustrate	0	6	14
strategy	0	2	0
strategic	0	1	0
extraterrestial	0	1	0
trans-47			
transact	47	0	0
tribu-23			
tribunal	3	0	0
tribute	1	19	0
truct-26			
construct	4	18	4
tures-22			
features	0	0	21
picturesque	0	1	0
ulate-29			
formulate	0	15	11
articulate	0	0	3
under-46	understand	misunderstnad	thunder
thunder	39 (1)	2	1
founder (laundering)	0	4	0

Pentagrams - Alphabetic Listing

	Initial	Medial	Final
ution-38			
revolution	0	7	27
caution	0	1	3

Pentagram - Rank List

	Initial	Medial	Final
ation-476			
situation	0	22	436
equation	0	2	0
national	0	16	0
tions-194			
nations	0	2	192
ratio-89			
ratio			
celebration	2	76	0
rational	9	0	0
inter-83			
winter	71	6	0
painter	0	4	0
interior	2	0	0
ition-81			
position	19	0	62
ating-76			
operating	0	1	62
coating	0	0	4
eating	0	0	8
sweating	0	0	1
ement-72			
statement			
element	0	0	1
ional-70			
national	0	22	47
rationale	0	1	0
ering-63			
considering	0	0	58
peering	0	0	5

Pentagrams - Rank List

	Initial	Medial	Final
ssion-63			
suppression	0	16	47
cally-50			
specifically	0	0	50
ments			
elements	0	0	50
ative-48			
declarative	0	4	31
(illustrative)			
administrative	0	2	11
icall-48			
statistically	0	0	48
trans-47			
transact	47	0	0
under-46		misunderstand	thunder
under	30	2	1
founder	0	4	0
(laundering)			
ities-45			
facilities	0	0	45
sting-43			
sting (1)	0	8	34
tical-43			
political	0	21	22
graph-41			
graph (1)	2	15	7

Pentagrams - Rank List

	Initial	Medial	Final
ility-41			
utility	0	0	41
press-40			
press (1)	6	29	3
cypress	0	0	1
lling-38			
telling	0	3	35
sions-38			
decisions	0	0	16
discussions	0	0	22
ution-38			
revolution	0	7	27
caution	0	1	3
bilit-37			
possibility	0	37	0
ously-37			
graciously	0	0	37
tract-37			
contract	4	25	8
minat-36			
eliminate	0	33	0
indeterminate	0	3	0
spect-36			
respect	10	15	11
table-36			
table (2)	3	0	4
tables			
comfortable	0	0	26
tablet	1	0	0

Pentagrams - Rank List

	Initial	Medial	Final
contr-35			
contract	34	1	0
count-35			
count (2)	14	8	6
counts			
country	5	0	0
strat-34			
demonstrate	0	0	28
strategy	5	1	0
ently-33			
frequently	0	0	33
light-33			
light (2)	7	8	16
lights			
ograp-32			
photograph	0	19	0
photography	0	13	0
ental-31			
dental	0	8	21
mentality	0	2	0
ality-30			
quality	0	0	6
reality	0	0	24
compa-30			
compact	2	2	0
companion	14	0	0
company	4	8	0

Pentagrams - Rank List

	Initial	Medial	Final
const-30			
constant	26	4	0
erate-30			
operate	0	11	8
desperate	0	3	7
aerated	0	1	0
ident-30			
resident	0	13	8
identical	9	0	0
shing-30			
washing	1	2	27
tered-30			
scattered	0	0	30
ching-29			
watching	0	0	28
aching	0	0	1
ified-29			
specified	0	0	29
posit-29			
deposit	5	3	2
opposite	0	1	0
position	1	17	0
ulate-29			
formulate	0	15	11
articulate	0	0	3
ening-28			
listening	0	0	27
screening	0	0	1

Pentagrams - Rank List

	Initial	Medial	Final
inate-28			
terminate	0	15	11
indeterminate	0	0	2
rated-28			
rated (1)	0	0	27
lated-27			
populated	0	0	27
speci-27			
special	21	4	0
species	1	1	0
struc-27			
construct	5	22	0
essed-26			
expressed	0	1	22
professedly	0	3	0
missi-26			
admissible	2	1	0
missing	3	3	0
commission	2	15	0
rable-26			
considerable	0	0	26
resse-26			
stressed	0	0	26
truct-26			
construct	4	18	4

Pentagrams - Rank List

	Initial	Medial	Final
fully-25			
fully (1)	0	0	24
ively-25			
respectively	0	0	24
lively	0	0	1
super-25			
super (1)	17	0	0
superfluous	4	0	0
superior	3	0	0
atter-24			
chatter	0	16	7
cattering	0	1	0
elect-24			
elect (1)	15	6	2
ished-24			
published	0	0	24
automatic	0	7	17
rator-24			
operator	0	0	15
laboratory	0	7	2
other-24			
another	4	2	12
bother	0	2	2
smoother	0	0	1
psychotherapy	0	1	0
trate-24			
illustrate	0	6	14
strategy	0	2	0
strategic	0	1	0
extraterrestial	0	1	

Pentagrams - Rank List

	Initial	Medial	Final
alize-23			
generalize	0	15	8
ances-23			
chances	4	0	6
allowances	0	0	13
commu-23			
communicate	18	1	0
communists	4	0	0
enter-23			
enter (1)	12	2	8
iment-23			
experiment	0	10	13
tribu-23			
tribunal	3	0	0
tribute	1	19	0
ained-22			
obtained	0	0	22
alist-22			
socialist	0	8	14
ately-22			
immediately	0	0	22
ature-22			
nature	0	0	5
temperature	0	1	11
creature	0	1	4
espon-22			
respond	0	22	0

Pentagrams - Rank List

	Initial	Medial	Final
lized-22			
realized	0	0	22
right-22			
right (2)	6	8	6
rights			
tures-22			
features	0	0	21
picturesque	0	1	0
appro-21			
approach	9	1	0
approval	3	3	0
approximate	5	0	0
esses-21			
addresses	0	0	21
gener-21			
general	21	0	0
gical-21			
logical	0	3	18
ingly-21			
willingly	0	0	21
inten-21			
intended	19	1	0
maintenance	0	1	0
logic-21			
logic (1)	2	17	1
meter-21			
kilometer	0	0	14
millimeters	3	0	3
cemetery	0	1	0

Pentagrams - Rank List

	Initial	Medial	Final
organ-21			
organ (2) organs	11	4	0
organic	3	1	0
parti-21			
participants	17	1	0
partial	2	1	0
stand-21			
understand	8	8	5
minis-20			
reminiscent	5	9	0
diminish	0	6	0
rence-20			
difference	0	0	20
round-20			
round (1)	5	5	9
state-20			
state (1)	10	3	5

Hexagrams - Alphabetic List

	Initial	Medial	Final
action-29			
action			
actions (2)	0	4	23
ations-107			
foundations	0	2	104
equations	0	0	1
bility-20			
ability	0	0	30
cation-58			
education	0	3	55
contin-21			
continent	4	1	0
contingency	14	2	0
commen-20			
commence	8	5	0
comment	7	0	0
commun-20			
communial	14	1	0
communist	5	0	0
dition-24			
additional	0	12	12
ection-44			
inspection	0	4	40
ective-27			
detective	0	6	21
ending-22			
ending			
endings (2)	0	0	20
ention-20			
mention	0	6	14

Hexagrams - - Alphabetic List

	Initial	Medial	Final
ession-35			
session	0	8	27
gation-21			
delegation	0	3	18
iation-26			
deviation	0	0	26
ically-48			
practically	0	0	48
iction-20			
fiction	0	3	17
itions-20			
positions	0	0	20
lation-48			
relation	0	2	46
mental-21			
mental (1)	2	15	11
mentality	1	1	0
nation-51			
nation			
nations (3)	1	1	37
nations'			
international	7	2	0
ration-87			
ration	2	1	76
rations			
rational	5	1	0
respon-22			
respond	13	9	0

Hexagrams - Alphabetic List

	Initial	Medial	Final
scribe-11			
scribe (1)	0	7	3
script-15			
script (1)	2	7	5
sition-23			
position	0	2	21
strate-15			
demonstrate	0	7	5
strategy	2	0	0
strategic	1	0	0
tation-63			
station	0	2	61
strict-13			
strict (1)	0	8	4
struct-26			
instruct	4	18	4
tional-61			
national	0	20	40
rationale	0	1	0
tribut-20			
contribute	1	14	0
contribution	0	5	0
zation-31			
organization	0	2	29

Hexagrams - Rank List

	Initial	Medial	Final
ations-107			
foundations	0	2	104
equations	0	0	1
ration-87			
nation (2)	2	1	76
nations			
rational	5	1	0
tation-63			
station	0	2	61
tional-61			
national	0	20	40
rationale	0	1	0
cation-58			
education	0	3	55
nation-51			
nation			
nations	1	1	37
nations'			
international	7	2	0
ically-48			
practically	0	0	48
lation-48			
relation	0	2	46
ection-44			
inspection	0	4	40
ession-35			
session	0	8	27
zation-31			
organization	0	2	29

Hexagrams - Rank List

	Initial	Medial	Final
bility-30			
ability	0	0	30
action-29			
action			
actions (2)	0	4	23
ective-27			
detective	0	6	21
iation-26			
deviation	0	0	26
struct-26			
instruct	4	18	4
dition-24			
additional	0	12	12
sition-23			
position	0	2	21
ending-22			
ending			
endings (2)	0	0	20
respon-22			
respond	13	9	0
contin-21			
continent	4	1	0
contingency	14	2	0
gation-21			
delegation	0	3	18
mental-21			
mental (1)	2	5	11
mentality	1	1	0

Hexagrams - Rank List

	Initial	Medial	Final
commen-20			
commence	8	5	0
comment	7	0	0
commun-20			
communial	14	1	0
communist	5	0	0
ention-20			
mention	0	6	14
iction-20			
fiction	0	3	17
itions-20			
positions	0	0	20
tribut-20			
contribute	1	14	0
contribution	0	5	0
script-15			
script (1)	2	7	0
strate-15			
demonstrate	0	7	5
strategy	2	0	0
strategic	1	0	0
strict-13			
strict (1)	0	8	4
scribe-11			
describe (1)	0	7	3

Heptagrams - Alphabetic List

	Initial	Medial	Final
ability-18			
ability (1)	0	0	17
ational-30			
national	0	11	4
vocational	0	1	13
rationale	0	1	0
cations-14			
vacations	0	0	14
ception-12			
exception	0	2	10
collect-12			
collect (2)	0	10	0
collects			
conside(r)-12			
(r always follows)			
consider (2)	7	3	0
considers			
constru(ct)-11			
(ct always follows)			
construct	7	4	0
develop-12			
develop (2)	6	4	0
develops			
ections-16			
sections	0	0	16
eration-26			
operation	0	1	24
aeration	0	0	1
ference-14			
difference	0	0	14

	Initial	Medial	Final
(i)ficatio(n)-26			
(n always follows)			
(i always precedes)			
identification	0	26	0
graphic-13			
graphic (1)	0	4	8
ication-46			
communication	0	0	46
ination-25			
determination	0	1	24
itation-19			
imitation	0	1	16
citation	0	0	1
exploitation	0	0	1
ization-31			
organization	0	2	29
lations-15			
relations	0	0	13
relationships	0	0	2
lection-12			
collection	0	0	12
lization-16			
(n always follows)			
civilization	0	1	15
logical-19			
logical (1)	1	2	15
minatio(n)-15			
(n alwyas follows)			
determination	0	1	14
mission-17			
mission (2)	2	2	11
missions			

	Initial	Medial	Final
nstruct-18	0	15	3
oligical-17 psychological	0	17	0
olution-14 revolution	0	4	10
(p)osition-18 (p always precedes) position	0	1	17
plement-12 complement	0	7	5
pressio(n)-12 (n always follows)	0	2	10
raction-16 fraction	0	3	13
rations-17 rations (1)	0	0	16
ression-17 expression	0	2	15
tations	0	0	17
tically-20 practically	0	0	20
tration-14 administration	0	0	14
ulation-18 population	0	18	0

Heptagrams - Rank List

	Initial	Medial	Final
ication-46			
communication	0	0	46
ization-31			
organization	0	2	29
ational-30			
national	0	11	4
vocational	0	1	13
rationale	0	1	0
eration-26			
operation	0	1	24
aeration	0	0	1
(i)ficatio(n)-26			
n always follows			
i always precedes			
identification	0	26	0
ination-25			
determination	0	1	24
tically-20			
practically	0	0	20
itation-19			
imitation	0	1	16
citation	0	0	1
exploitation	0	0	1
logical-19			
logical(l)	1	2	15
ability-18			
ability(l)	0	0	17
nstruct-18			
construct	0	15	3
(p)osition-18			
(p always precedes)			
position	0	1	17

	Initial	Medial	Final
ulation-18			
population	0	1	17
mission-17			
mission	2	2	11
missions (2)			
oligical-17			
psychological	0	17	0
rations-17			
rations (1)	0	0	16
ression-17			
expression	0	2	15
tations-17			
stations	0	0	17
ections-16			
sections	0	0	16
lizatio(n)-16			
n always follows			
civilization	0	1	15
raction-16			
fraction	0	3	13
lations-15			
relations	0	0	13
relationships	0	0	2
minatio(n)-15			
(n always follows)			
determination	0	1	14
cations-14			
vacations	0	0	14

	Initial	Medial	Final
ference-14			
difference	0	0	14
olution-14			
revolution	0	4	10
tration-14			
administration	0	0	14
graphic-13			
graphic(1)	0	4	8
ception-12			
exception	0	2	10
collect-12			
collect			
collects(2)	0	10	0
con ide(r)-12			
(r always follows)			
consider			
considers(2)	7	13	0
develop-12			
develop			
develops(2)	6	4	0
lection-12			
collection	0	0	12
plement-12			
complement	0	7	5
pressio(n)-12			
(n always follows)			
suppression	0	2	10
constru(ct)-11			
(ct always follows)			
construct	7	4	0

PROJECT III

The results from Project I lend support to the potential value of utilizing higher order units in teaching reading. Project III was designed to analyze the existence of higher order units in the running text of two widely used reading series, the Ginn 360 series levels 3-4 and the Lippincott series levels Preprimer--3-2.

PROCEDURE

All of the running texts (except phonics lessons and numerals) of the first two levels used and one out of every ten pages of the other levels used were punched onto computer cards. A program was written that counted the frequency of the various words in the running text and produced a set of punched cards containing the corpus for use in the programs described in Project II. A corpus was produced for each level in each series and for all even numbered combinations. Thus, for example, in the Ginn series there is a corpus for each of the eight levels 3-10, one for 3 and 4 combined, 5 and 6 combined, etc., one for 3 and 4 and 5 and 6 combined, one for 3 and 4 and 5 and 6 and 7 and 8 combined, and one for all eight levels combined. The preliminary analyses that have thus far been made are primarily restricted to the first level and the combination of all levels in each series.

RESULTS

Table 8 shows the number of words examined at each individual level and number of unique words found in that examination.

TABLE 8

Examined Words and Unique Words in Running Text

	No. Words Examined	No. Unique Words in Those Examined
Ginn		
Level 3*	1214	62
4*	1512	100
5**	743	220
6**	1213	306
7**	2675	665
8**	3152	913
9**	3894	1016
10**	4403	1219
All***	18806	2417
Lippincott		
PrePrimer*	265	64
Primer*	501	362
1-1**	1022	363
1-2**	1020	388
2-1**	2356	729
2-2**	2366	772
3-1**	3177	975
3-2**	4105	1101
All***	16313	2516

* all running text analyzed
** ten percent of text analyzed

The differences in the two series at the upper levels are very minimal. However, at the first two levels differences are considerable. In the first book they introduce nearly the same number of words (62 and 64) but the Ginn series uses these words in a text of 1214 words compared to only 265 for the Lippincott. Table 9 which shows the 21 most frequently occurring trigrams in each series reflects this difference.

TABLE 9

Comparison Between One Level of Running Text
and the Corpus by Rank and Frequency of 21 Trigrams

Ginn Level 3			Corpus Project II		Lippincott Preprimer			Corpus Project II	
Rank	Gram	Freq.*	Rank	Freq.**	Rank	Gram	Freq.*	Rank	Freq.**
1.	ill	108	163	145	1.	run	26	991	25
2.	aid	84	1223	19	2.	the	17	68	172
3.	sai	84	1551	13	3.	red	14	26	260
4.	can	73	348	67	4.	and	12	60	186
5.	you	61	1185	20	5.	dog	10	2236	7
6.	tle	56	348	67	6.	pat	8	302	72
7.	her	41	59	187	7.	dro	7	1022	24
8.	rtl	40	1554	11	8.	pet	7	621	40
9.	tur	40	90	149	9.	rop	7	265	79
10.	urt	40	833	31	10.	rag	7	445	55
11.	ere	39	44	218	11.	uns	7	808	33
12.	ben	35	1223	19	12.	ast	6	91	148
13.	wil	34	1185	20	13.	fas	6	1273	18
14.	the	34	68	172	14.	rug	6	1472	14
15.	his	30	924	27	15.	can	5	348	67
16.	thi	30	454	54	16.	tom	5	808	33
17.	bil	29	466	53	17.	top	5	1223	19
18.	due	27	377	64	18.	dri	4	748	34
19.	jil	27	4395	0	19.	egg	4	2495	4
20.	lit	26	98	143	20.	man	4	99	142
21.	ttl	26	924	27	21.	rip	4	555	45

* frequency here means the total number of times this trigram appears in the text

** number of words this trigram appears in the text

The most frequently used trigram in the Lippincott series occurs only 26 times which is the same frequency as the 21st trigram in the rank order list of the Ginn level 3. Table 8 also includes a comparison between the rank orders of the running text of the readers and the corpus examined in Project II. In Ginn level 3 the trigram ill is most frequent with a frequency of 108 and a rank of 1. In the corpus of Project II, there are 162 trigrams that occur in more words than ill does, an ill appeared in 145 different words. Jil never appeared in the list of 4395 trigrams (in the Project II corpus) but was 19th in Ginn level 3. Noticeably absent from Table 8 are some of the highly frequent and highly consistent trigrams such as ing, ion, ent, ter, ted, con, ons, etc. The trigram ing occurs 1554 times and has three mappings: sing-1537; impinge-14; and ingredient-3. Its high frequency and consistency seem to imply that it may be a highly useful higher order unit. However, it does not appear in the Lippincott Preprimer or the Primer. It does occur in Ginn level 4 sixteen times in the word something and 13 times in the word gingerbread. The child is thus encountering its very rare mapping nearly as many times as its highly frequent mapping. From the data available, other similar comparisons can be made.

TABLE 10

Comparison between All Levels of Running Text and the Corpus
by Rank and Frequency of 25 Trigrams

Ginn All Levels			Corpus from Project II		Lipp All Levels			Corpus from Project II	
Rank	Gram	Freq.	Rank	Freq.	Rank	Gram	Freq.	Rank	Freq.
1	ing	178	1	1554	1	ing	176	1	1554
2	and	36	60	186	2	ent	43	4	719
3	her	36	59	187	3	ter	42	6	501
4	igh	35	105	139	4	ear	38	109	136
5	ght	34	112	135	5	her	38	59	187
6	hin	30	147	116	6	the	36	68	172
7	ers	29	11	414	7	ght	36	112	135
8	ent	28	4	719	8	ste	35	34	239
9	all	28	23	275	9	rea	32	49	213
10	led	26	72	166	10	igh	31	105	139
11	ear	25	109	136	11	led	31	72	166
12	ked	25	259	81	12	and	29	60	186
13	red	25	26	260	13	red	29	26	260
14	rea	25	49	213	14	der	28	50	208
15	ide	24	75	163	15	ers	28	11	414
16	les	24	56	196	16	him	28	2183	6
17	lin	24	38	232	17	ted	28	7	477
18	ere	23	44	218	18	all	27	23	275
19	rin	23	43	225	19	ard	26	109	136
20	ill	23	95	145	20	res	26	12	363

TABLE 10
(cont.)

Ginn All Levels			Corpus from Project II		Lipp All Levels			Corpus from Project II	
Rank	Gram	Freq.	Rank	Freq.	Rank	Gram	Freq.	Rank	Freq.
21	han	23	220	81	21	ant	24	33	242
22	ine	22	34	239	22	lin	24	38	232
23	ast	22	91	148	23	est	24	20	280
24	ind	22	129	125	24	ide	24	75	163
25	ppe	21	263	80	25	ick	24	376	64

Table 10 gives similar comparisons as those in Table 8 using the analysis of the combined eight levels of each of the reading series. As one can see, some of the high frequency trigrams are included in the texts, i.e., ing, ent, ter, ted, ers, and est.

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Appendix A: Sample Terminal Sheet

** NOTE: This sample shows the introduction, and the first part of the practice phase, for an S in the ABD. The S's responses have been circled to distinguish them from the computer's responses. This NOTE has also been added. Nothing else has been changed.

s55/exp
11/18/71 09:11 LINE 9
YOUR NAME IS ? (Z)

THERE IS A NUMBER IN THE CIRCLE ON YOUR YELLOW SHEET.
PLEASE TYPE THAT NUMBER.
THANK YOU.

HELLO. Let's play a guessing game today.
But first, please tell me your first name.

(Angel)

Thank you.
I can use your name, now, instead of a number.

Now, Angel, here's how the guessing game is played.
I'll type symbols and you type numbers.
Let's try it. Type any number you want.

+ (4)
No, it's
+ 6
(5 SECONDS)

OK. Now, the above example shows that, in our game,
+ and 6 always go together.
So your guess was wrong since you guessed 4 .

That means every time I type +
What do you type? (6)
You've got it!

In our game, other numbers go with other symbols.
Do you already know which numbers go with which symbols?
(answer yes or no)
(no)
That's right. You'll have to guess at first, like you did before.
That's part of the guessing game.

For example, when I type symbols other than +
you'll have to guess at numbers like you did before.
Then I'll tell you if you made the right guess, like before,
and you'll gradually learn what goes together, just like you learned that
+ and 6 go together.

Let's try one more example. Press RTN and EOB.

OK.

! (2)
No, it's
! 5
(5 SECONDS)

You are doing fine, Angel.
I think you know how to play our guessing game.
Don't worry about making the wrong guess. That's part of our game.
The game will just take a few minutes to play.
Press RTN and EOB and we'll start.

OK. I'll type symbols and you guess and type numbers.
You won't know the numbers at first, so guess.
Then type your answer right away.
Press RTN and EOB to start.

YOU HAVE 5 SECONDS TO ANSWER EACH TIME.
GUESS IF YOU NEED TO, AND ANSWER IMMEDIATELY.

+ (6)

(1 SECONDS)

"(4)
Right.
(2 SECONDS)

$(2)
No, it's
$ 9
(4 SECONDS)

!(4)
No, it's
! 5
(3 SECONDS)

)(7)
No, it's
) 8
(5 SECONDS)

#(8)
No, it's
7
(4 SECONDS)

!(5)
Right.
(3 SECONDS)

$(7)
No, it's
$ 9
(4 SECONDS)

"(4)
Right.
(2 SECONDS)

•(6)
Right.
(3 SECONDS)

)(9)
No, it's
) 8
(3 SECONDS)

#(9)
No, it's
7
(1 SECONDS)

"(4)
Right.
(1 SECONDS)

•(8)
No, it's
• 6
(3 SECONDS)

!(9)
No, it's
! 5
(4 SECONDS)

•(8)
No, it's
• 6